

REPORT
OF
THE FOURTH
INDIAN INDUSTRIAL CONFERENCE
HELD AT MADRAS
ON THE
26th and the 27th December, 1908.

ED BY THE GENERAL SECRETARY,
INDIAN INDUSTRIAL CONFERENCE, AMRAOTI.

1909.

Publications of the Indian Industrial Conference.



(1)

REPORT OF THE First Indian Industrial Conference

HELD AT

BENARES, IN DECEMBER, 1905.

Reduced Price—Rupee One only. Per V.P.P. Rs. 1-5-0.

(2)

REPORT OF THE Second Indian Industrial Conference

Copies to be

THE GENERAL SECRETARY,

The Indian Industrial Conference,

AMRAOTI (BERA) (B).

REPORT

THE FOURTH

INDIAN INDUSTRIAL CONFERENCE

HELD AT MADRAS

ON THE

26th and the 27th December, 1908.



PUBLISHED BY THE GENERAL SECRETARY,
THE INDIAN INDUSTRIAL CONFERENCE, AMRAOTI.

1909.

All Rights Reserved]

[Price—Rupees Two only

MADRAS:
PRINTED BY SRINIVASA VARADACHARI & CO.,
MOUNT ROAD.

CONTENTS.

	PAGE
Introduction	ix
Summary of Proposals	xxxv
Resolutions passed by the Conference	i
Speech of Déwan Bahadur P. Rajarathnam Mudaliar, C.I.E., Chairman of the Committee	5
Election of the President	16
Address of the President, Rao Bahadur R. N. Mudholkar.	19
Presentation of the Annual Report: Speech by Dewan Bahadur Ambalal S. Desai	56
Adoption of the Report :	
Speech by the Honourable Sir Vithaldas D Thackersey, KZ. (Bombay)	57
„ Dewan Bahadur K Krishnaswami Rao, C.I.E. (Madras)	60

The Papers.—

(i) Twenty-five Years' Survey of Indian Industries: <i>By</i> <i>Professor V. G. Kale, Poona</i>	61
(ii) The Education of Persons who intend to make Scientific Investigation to take part in Industrial Development: <i>By Dr. Morris W. Travers, F.R.S.,</i> <i>Bangalore</i>	75
(iii) The Education of Engineers in the Bombay Presi- dency: <i>By Major W. V. Scudamore, R.E., Poona</i>	79
(iv) Agricultural Indebtedness: <i>By Lakhbhai Samaldas,</i> <i>Esq., Bombay</i>	85
(v) An Introduction to Co-operative Credit: <i>By H. R.</i> <i>Crosthwaite, Esq., I.C.S., Jubbulpore</i>	93
(vi) Co-operative Credit Societies and the Problem of Organisation: <i>By W. H. Buchan, Esq., I.C.S.,</i> <i>Calcutta</i>	115

(vii) Credit Institutions in the Madras Presidency : <i>By R. Ramachandra Rao, Esq., Madras</i> ...	126
(viii) Agricultural Banks and Co-operative Societies in the Mysore State : <i>By M. Shama Rao, Esq., Bangalore</i> ...	130
(ix) A Scheme of a Central Financing Society : <i>By the Hon. Sir Vithaldas D. Thackersey, Kt., and Lalubhai Samaldas, Esq., Bombay</i> ...	137
(x) The Indian System of Banking and other Business : <i>By Rai Bahadur Lala Baij Nath, Agra</i> ...	143
(xi) The Problem of the Indigenous Workman : <i>By A. Tellery, Esq., Benares</i> ...	158
(xii) The Government and Industrial Development : <i>By N. Pattabhirama Rao, Esq., Madras</i> ...	162
(xiii) Agricultural Improvements in the Central Provinces : <i>By D. Clouston, Esq., Nagpur</i> ...	170
(xiv) Irrigation by Pumping : <i>By Alfred Chatterton, Esq., Madras</i> ...	176
(xv) Some Remarks about the Practice of using Cow-dung as Fuel : <i>By Professor J. B. Knight, Poona</i> ...	203
(xvi) Expression and Extraction of Oil : <i>By P. Ray Chaudhuri, Esq., Calcutta</i> ...	205
(xvii) An Opening for Small Dye Works in Bengal : <i>By Professor E. R. Watson, Dacca</i> ...	244
(xviii) A Few Hints for the Consideration of those who may intend to establish New Oil Mills : <i>By Rao Bahadur D. V. Bhagavat, Akota</i> ...	253
(xix) The Aloe Fibre Industry : <i>By J. N. Banerjee, Esq., Calcutta</i> ...	257
(xx) The Artistic Trades of the Punjab and their Development : <i>By Percy Brown, Esq., Lahore</i> ...	260
(xxi) Home Industries for Indian Women : <i>By Dr. M. C. Nunjunda Rao, Madras</i> ...	268
(xxii) The Central Provinces and Berar Exhibition of 1908 : <i>By C. E. Low, Esq., Nagpur</i> ...	279
(xxiii) The Industrial Ascendency of the Nations : <i>By C. Gopal Menon, Esq., Madras</i> ...	300

	PAGE
(xxiv) Agricultural Improvements in the Madras Presidency :	
By M. R. Ramakrishna Iyer, Esq., Tinnevely.	319

Speeches on the Resolutions.—

The President	...	...	...	387
<i>The First Resolution (Departments of Industry).</i>				
D. E. Wacha, Esq. (Bombay)	...	...	...	388
Rao Bahadur G. Srinivasa Rao (Madura)	...	...	...	392
R. V. Mahajani, Esq. (Akola)	...	...	...	395
<i>The Second Resolution (Technical and Industrial Education).</i>				
The Honourable Pandit Madan Mohan Malaviya (Allahabad)	...	...	...	395
The Honourable Mr. Gokuldas K. Parekh (Bombay)	...	...	...	399
T. Rangachariar, Esq. (Madras)	...	...	...	400
Professor B. Heaton (Calcutta)	...	...	...	403
The President	...	...	...	406
<i>The Third Resolution (Commercial Education).</i>				
K. Subramani Aiyar, Esq. (Bombay)	...	...	...	407
D. G. Dalvi, Esq. (Bombay)	...	...	...	410
Professor H. B. Lees-Smith (London)	...	...	...	412
The President	...	...	...	417
<i>The Fourth Resolution (Agricultural Banks).</i>				
Lalubhai Samaldas, Esq. (Bombay)	...	...	...	417
Rao Bahadur Khandubhai G. Desai (Surat)	...	...	...	418
Rao Bahadur V. K. Ramanujachariar (Kumbakonam)	...	...	...	421
<i>The Fifth Resolution (Cotton Excise Duty).</i>				
Uttamlal K. Trivedi, Esq. (Bombay)	...	...	...	423
Pandit Rambhaji Dutt Chaudhuri (Lahore)	...	...	...	424
<i>The Sixth Resolution (Railway Rates on Goods).</i>				
Dewan Bahadur Ambalal S. Desai (Ahmedabad)	...	...	...	425
Rao Bahadur Deorao Vindayak (Akola)	...	...	...	427

	PAGE
<i>The Seventh Resolution (Mining, Weaving and Sugar Industries)</i>	
The Honourable Sir Vithaldas D. Thackersey, <i>Kt.</i> (<i>Bombay</i>)	428
G. Subramania Iyer, Esq. (<i>Madras</i>) ...	432
The Honourable Mr. H. S. Dikshit (<i>Bombay</i>) ...	436
The President	437
<i>The Eighth Resolution (Office-Bearers and Funds for 1909).</i>	
N Subbarao Pantulu, Esq (<i>Rajahmundry</i>) ...	439
Munshi Ganga Prasad Varma (<i>Lucknow</i>) ...	442
<i>Vote of Thanks to the President.</i>	
Rao Bahadur M. Adinarayanah Iyah (<i>Madras</i>) ...	442
The Honourable Sir Vithaldas D. Thackersey (<i>Bombay</i>)	443
The President's Concluding Speech ...	445
Appendix I.	
Bye-laws for a Rural Co-operative Credit Society and of a Central Bank	i
Appendix II.	
The Victoria Jubilee Technical Institute, Bombay, being a Record of Twenty Years' Progress: <i>By</i> <i>Ramakrishna M. Chonkar, Esq, Bombay</i> ...	xi
Appendix III.	
The Date Sugar Industry of the Twenty-four Par- ganahs: <i>By Babu Annada Prasad Ghose, Cal-</i> <i>cutta.</i> The Progress and Development of the Co-operative Credit Movement in India: <i>By</i> <i>Babu Jogendra Nath Samaddar, Tangail</i> ...	xlii
Appendix IV.	
List of Delegates to the Fourth Indian Industrial Conference	xlvi
Appendix V.	
Resolutions of the First, the Second and the Third Indian Industrial Conference	xlix

Report on the Work of the Indian Industrial Conference and Record of General Industrial Activity in the Country in the year 1908	...	1—6
Index to the Report of the Conference	...	i—xiv
Index to the Annual Report	...	xv—xxiii
Errata	...	xxiv

INTRODUCTION.



‘Of all the complex questions which our countrymen are called upon to solve, there is none which transcends the industrial and economic problem in the intricacy of its nature and the far-reaching importance of its results. Our well-being in the immediate present and our progress in the future are as much dependent upon the establishment of a healthy condition of industrial activity as upon political advancement or social reform, and the same self-sacrifice and devotion to duty are required from our public men by the first as by the other two. Indeed most of the political and social questions which confront us and make urgent demands upon our close application are at their base economic. It is only by a full recognition of the intimate connection and inter-dependence of these three spheres of activity, that it is possible to ensure a healthy existence for the nation. Non-political though the Industrial Conference is in its character, the matters with which it has to deal cannot be dissociated from administrative policy and measures or the intellectual and moral condition of the people. It is only by a well-regulated treatment of all the three classes of questions that progress can be achieved.’—*Presidential Address by Rao Bahadur R. N. MUDHOLKAR* (pp. 19-20 of Report).

THE Fourth Indian Industrial Conference, which was held at Madras on the 26th and the 27th December 1908, was even a more successful function than the three preceding sessions. It was far better attended, and the proceedings were more lively. At least in part this was due to the Conference having been held before the National Congress, when interest in public gatherings was still fresh and the people who were drawn to them had not become satiated with the flood of exciting political oratory. The lesson of the Madras Conference clearly is that whenever it can be so arranged the Industrial Conference should be held before the Congress. It may be added that the experience of the South Indian Industrial Conference, the third session of which was recently held at Berhampore on the occasion of the Sixteenth Madras Provincial Conference, as compared with the preceding sessions at Vizagapatam and Tinnevely, teaches the same lesson. Before we proceed to a narrative of the proceedings, there was a fact which lent distinction to the last session, which must be gratefully mentioned. We refer to the presence at it of

His Excellency the Governor of Madras, Sir Arthur Lawley, accompanied by Her Excellency Lady Lawley. The Government have given unmistakable evidence of their sympathy with the Industrial Conference from the very commencement, but this was the first time when the head of the Government honoured it by a visit. It need not be said that the gracious act of Sir Arthur Lawley's was highly appreciated by all the members of the Conference.

The proceedings were opened with an able and thoughtful speech by Dewan Bahadur P. Rajarathnam Mudaliar, C.I.E., the Chairman of the Committee which was in charge of the local arrangements. Dewan Bahadur Rajarathnam Mudaliar is a veteran in years and in experience. He held many responsible positions under Government, including the office of Inspector-General of Registration, was a member of the Madras Legislative Council for several years, and was the Indian Member of the Irrigation Commission. After retirement from service he has been devoting a great deal of time and energy to industrial and educational questions. He is the life and soul of the P. T. Lee Chengalvaraya Naicker's Technical Institute, which, since its re-organization by the Dewan Bahadur, has been doing very useful work, is the senior Vice-President of the Madras National Fund and Industrial Association, and a Trustee of Pachaiyappa's College. The words of such a man were necessarily listened to with respect. Dewan Bahadur Rajarathnam Mudaliar in his speech expressed the public sense of disappointment at the action of the Madras Government in not giving to the recommendation of the Ootacamund Industrial Conference—which was convened by themselves—that the Madras College of Engineering should be expanded into an Institute of Technology; spoke of the need of protective tariffs for a country situated as India is; protested against the excise duty on Indian cotton goods; and dwelt at some length on the utility of improved hand-looms with the fly-shuttle attachment. His account of the action taken by the Madras National Fund and Industrial Association for popularising the improved looms was interesting indeed.

The President of the Conference was Rao Bahadur R. N. Mudholkar, who has been the General Secretary since the very first Conference was held at Benares in 1905. Mr. Mudholkar's

address was a comprehensive one in which almost the whole range of the problem was covered. The speaker began with the beginning, as it were, when he discoursed on the influence of the ascetic ideal, which has been *par excellence* the Indian ideal, on the course of our national history. The fashion which this ideal 'created of talking disparagingly of mundane affairs, operated in no small degree in bringing about our political degeneration and industrial decay.' The amassing of wealth was not held to be a respectable ambition, and accordingly men of brains and with opportunities paid no heed to the development of the resources of the country. 'The downfall of our industries, arts and trade, is as much due to this cause as to the heavy disabilities and restrictions imposed upon them by the economic and fiscal policy of England and other countries.' Fortunately, the light that has dawned on the people from the West has changed the direction of individual and national aspirations to a certain extent, and men have even begun to discover that

'*Artha* (acquisition of wealth), instead of being stigmatised as unworthy of pursuit, is by the ancient Hindu law-givers recognised as one of the four highest duties of man.' And 'under the combined influence of the old teaching and the new, and made wiser by what we see around us, a more correct attitude has come to be recognised as imperative.' (P. 21.)

What more tangible evidence of this would one wish to have than the stronghold which the Swadesi movement has acquired over the public mind in every part of the country? Speaking on the Swadesi movement, Mr. Mudholkar pointed out :

It seeks to place this country on a level with the most advanced. Its methods are help and co-operation. It relies on science, skill and energy. It is in fact an application to the industrial problems of this country of the ideal comprised in the doctrine of nationality. It is not combative and aggressive, but merely demands from the people support and protection for the nascent industries of this country, in the keen competition they have to meet from the established ones of foreign lands.' (P. 22.)

He further remarked :

'No short cuts are possible or should be attempted. We must not lose sight of the fact that self-denying ordinances can have only a limited scope and a short life. They can only afford encouragement to efforts. The eventual success of these efforts depends upon their inherent suitability. The motive power which will lead our nation to industrial

eminence must come from the pursuit of science, the acquisition of practical skill and the organisation of capital.' (P. 22.)

The President next proceeded to take stock of the existing industrial situation. How lamentable it is !

'For the clothes we wear, the pots and pans in which we cook our food or from which we eat it, the lamps which light our houses and streets, the very iron from which the implements of our husbandry are made, we have to depend mostly on foreign countries.' P. (23.)

It is the aim of the industrial movement 'to supply all the necessities of life, and all the comforts and conveniences which cheer it from the materials which exist in abundance in the country.' Mr. Mudholkar first dealt with the foremost of India's national industries, Agriculture. Here 'one of the problems which we have to solve is how to increase the quantity of food products from a contracted and probably yearly diminishing food-producing area.' Intensive cultivation is a necessity. The out-turn per acre is much less in India than in countries where modern methods are in vogue. These therefore have to be introduced. Said Mr. Mudholkar :—

'Without venturing to lay down an universally applicable proposition, I would say this much with confidence, that experiments made by the Agricultural Department of the Government and by private individuals have demonstrated the feasibility of both increasing the quantity and improving the quality of our agricultural products by the adoption of methods which are not beyond the means or capacity of the ordinary cultivator, if more organised efforts on a larger scale are made by the educated leaders of the community and Government agencies, to spread more extensively than at present a knowledge of successful experiments, and if pecuniary facilities are supplied to landholders and cultivators.' (P. 26.)

The speaker followed up the above by several specific proposals.* Mr. Mudholkar then passed in rapid survey, the subjects of irrigation, lift irrigation, ryots' indebtedness, general education, land bank, settlement operations and suspensions, and remissions of land revenue, making definite suggestions in regard to every one of them.* With reference to the problem of agricultural indebtedness he pointed out that mortgages and sales went on increasing every year and that mere palliatives, mere symptomatic treatment would be of no avail. He pressed the need of free

* *Vide* 'Summary of Proposals.'

general education for increasing the efficiency of the agricultural population. Speaking on the ryot's need for cheap capital, Mr. Mudholkar said :

'The conditions under which loans and advances for improvement are made, the rigidity of the system, the great delay which takes place in obtaining sanction and actual payment of the advances made, considerably curtail the usefulness of the measures and hinder due resort to the facilities such as they are given. Co-operative credit Societies can produce little tangible effect on the condition of the agriculturists unless there is a net-work of them throughout the country, and the capital at their command is many times increased. And this is only possible if land banks similar to that in Egypt are established in every province with the help and co-operation of the local capitalists.'—(P. 29.)

Here Mr. Mudholkar uttered the necessary warning, that no scheme which disregarded the agency of the local capitalists or acted in opposition to them, 'has any chance of succeeding or carrying real relief to the needy peasantry.' Nor is there reason to ignore the local capitalists.

'Many a banker or money-lender has expressed his readiness to me (the speaker) to co-operate in the establishment of a land bank advancing money at half the prevailing rates of interest, if facilities for recovery similar to those provided for the Egyptian Bank are accorded.'—(P. 30.)

After agriculture the textile industry was naturally the first to receive the President's attention. He reviewed the position of the mill industry, and while at it, lodged a protest against the cotton Excise Duty. Then he turned to handloom weaving, and suggested means by which the Conference and the organizations affiliated to it could help in the popularisation of improved looms.* The next subject—and a subject of the greatest importance it is—on which Mr. Mudholkar offered lengthened remarks was Mines and Minerals. As his opinions expressed here have since been made the subject of adverse criticism by a Lieutenant-Governor—the Honourable Sir Lancelot Hare—we think it as well to call pointed attention to them at this place. Said Mr. Mudholkar :—

The gold mining industry 'is looked at with considerable shaking of the head and regarded as a typical illustration of foreign exploitation. Not one of the mining companies is Indian. The total value of gold raised during the quarter of a century that the Kolar Gold Fields have been at work, is roughly forty crores. Out of this only 1/19th or a little over two crores represents royalty, and nearly 50 p. c. has been distributed among

* *Vide* 'Summary of Proposals.'

the shareholders as dividend. The benefit to the people consisted only in the wages to labourers and clerks. There is neither the pecuniary gain from proprietorship, nor the valuable moral asset of training and experience in the scientific operations and the directing and controlling work. While the development of the mineral resources of a country is most desirable, care must be taken that too great a price is not paid for it. In view of the fact that minerals cannot be replaced or replenished a special, heavy responsibility lies upon both the people and the Government. The desire to stimulate production cannot justify the complete handing over of mines to persons who have no permanent interest in the land. On the one hand our people ought to realise that in the interests of the country itself our minerals have to be worked. No serious harm certainly can result from postponing for even a quarter of a century the extraction of precious metals like gold and precious stones like rubies or diamonds. But coal, iron, copper and all other like substances, which are articles of manufacture or help the processes of manufacture, are urgently demanded. If we do not show enterprise and energy, if we do not equip ourselves with the requisite knowledge and working capabilities, if we do not find the needed funds, there is imminent danger of outsiders reaping the entire benefit which the country's mineral resources are capable of yielding. On the other hand, as trustees of the permanent welfare of the Indian people, the Government should recognize the serious injury that would be caused to those interests from exploitation by outsiders who have no permanent stake in the country. This is not a question of colour, race or religion, but of Indian (including in that term domiciled Europeans and Eurasians) *versus* foreign capitalists. There is no analogy between the grant of mining rights to strangers and the borrowing of loans in foreign countries or the starting of manufactures with the help of foreign shareholders. These latter only receive interest or fair profit. The corpus of the loan or invested money continues to exist in the form of machinery, buildings and working capital. All this money reproduces itself, and what go to the outside creditor or absentee proprietor are the annual profits. The foreign owner or lessee of a mine, however, takes away the permanent wealth of the country without leaving any equivalent. What he takes away is lost to it for ever.' (Pp. 33-9.)

And Mr. Mudholkar urges :

' It is high time that action is taken by our people which would, if not put a stop to, at least minimise exploitation by outsiders. It would not be asking too much of Government to give preference to Indian applicants (including resident Anglo-Indians) over foreigners in the grant both of prospecting licenses and mining leases, and to further lay down a condition that in the case of a projected foreign company half its shares shall be placed on the Indian market, and that Indian shareholders shall have a proportionate representation on the managing board. There is no reason why as in Japan a minimum amount of 30 per cent, of the capital of a mining company should not be reserved for the men of the country, or why

the Government itself should not work all those mines for which capital cannot be obtained on the terms mentioned above.' (P. 40).

This is not the place for replying to criticisms, but really it is difficult to see what there is either unfair or unpractical in the foregoing, as urged by Sir Lancelot Hare. Mr. Mudholkar next turned to sugar, in which the country is steadily, even rapidly, losing ground notwithstanding a number of favourable conditions. Here is a reason :—

' In a mofussil station on the main line of one of our trunk railways, foreign refined sugar has been selling at the rate of Rs. 9 for every maund of 40 seers, sugar vouched as made in India by modern processes sells at the rate of Rs. 12 per maund, while what is called Benares sugar, that is, the sugar made by the indigenous process sells at the rate of Rs. 16.' (P. 41.)

This makes it perfectly obvious that 'it is only by establishing conditions which can permit the sale of the home-made articles on the same terms as the foreign, that it is possible to ensure the existence of the home industry.' On the subject of oil-pressing it is pointed out that 'the industry cannot be established on a firm basis unless the present scope of work is extended and connected industries like paints, varnishes, candles, soap are organised.' As regards tanning and leather-dressing, action requires to be taken to improve the processes. Having taken a brief glance at some other industries and the export and import trade, Mr. Mudholkar proceeded to speak of 'our work.' He said :

' If India is to be brought on a level with the advanced nations of the West and the farthest East, action is demanded all along the line. The production of food stuffs and of raw materials of manufacture grown on land has to be stimulated and increased, and the quality improved. Forest products, which are ceasing to have commercial importance, before the competition of cheaper substances prepared with the help of chemistry, are to be rehabilitated and rendered capable of use under the new conditions. A properly co-ordinated manufacturing system has to be established or expanded for raising those finished articles for which suitable material is available. The mineral resources of the country are to be developed and utilized for the benefit of the people, and a mercantile marine has to be created, for carrying on coasting trade and trade with other nations,' (Pp. 45-6.)

This is stupendous task. But if other nations who laboured under even greater disadvantages were able to accomplish it, why not the Indians? Derive encouragement from the case of

Germany and America. Their progress is due to the cultivation of the natural sciences and their application to industrial purposes.

‘As in those countries a complete system of scientific and technical instruction has to be established. Polytechnic institutes, engineering colleges, chemical-industries colleges, agricultural and sylvicultural colleges, commercial colleges must be established. The land must be studded with industrial and crafts schools. Trained captains of industries, trained masters, supervisors and assistants, equipped with the knowledge of the principles underlying their industries, and furnished with practical skill, and operatives with their general intelligence developed and their efficiency cultivated are needed.’ (P. 46.) *

‘But after all our salvation depends, not so much upon what the State will do, but upon what we are prepared to do ourselves.’ ‘Our very best men’ have to be ‘imbued with the true scientific spirit.’

‘Our ignorance of science, our antiquated ideas, our obsolete methods are more responsible for our poverty than all the other unfavourable factors taken together. Passionate devotion to science, gentlemen, is what India needs most at the present day. The brightest and the most capable of her sons must worship in that temple.’ (P. 50.)

In this connection Mr. Mudholkar drew attention to the achievement of Professor Bhise of Bombay, who has perfected a new machine which promises to revolutionise the art of printing through the novel and original processes invented by him in regard to type-casting and type-setting.’ On the question of railway freights the President said, ‘The freight charges on goods levied by these railways on inter-provincial consignments are so exorbitant that transport expenses over a few hundreds of miles in India are often more than those on shipments sent from a distance of six thousand miles.’

Mr. Mudholkar had something to say towards the conclusion of his address on the work of the Industrial Conference. It is time in his opinion, that those interested in it take a further step to increase its usefulness to the nation. His suggestion is ‘to create local organisations which will take charge of actual work, form companies, promote the establishment of manufacturing and commercial concerns and create general industrial activity.’ It may be mentioned here that it is at last possible for the Indus-

* For specific suggestions *vide* ‘Summary of Proposals.’

trial Conference to take credit for the successful promotion of one big concern at least—the Prayag Sugar Co., Ltd., of the factory of which Sir John Hewett laid the foundation stone the other day. This enterprise is the direct outcome of the Conference held at Allahabad two years ago.

The President's closing words were these :

‘We are face to face with a militant civilisation whose watch-word is efficiency and which fights with the weapons of knowledge and strenuous exertion. Our advance will be commensurate with our acquisition of this efficiency, this knowledge, this capacity for strenuous exertion.’

After the President's address Dewan Bahadur Ambalal Sakeral Desai as the President of the previous Conference presented the annual report,* which was adopted by the Conference on the motion of another ex-President, the Honourable Sir Vithaldas Thackersey, seconded by Dewan Bahadur Krishnaswami Rao the respected President of the Madras National Fund and Industrial Association. Sir Vithaldas in the course of his speech made some helpful observations on the manufacture of matches to which attention might be directed.

‘The essential condition of the success of a match factory’ he said, ‘is to get suitable kinds of wood, and in sufficient quantities to feed the factories for a number of years. It is not possible to import wood from a distance thousands of miles away and there make boxes or splints. In the match factories started in India some of them are manufacturing from woods which are not first class and that is the reason why they have not been able to drive away imported matches.’ (P. 58.)

The speaker gave some interesting particulars of a large central factory which he and some others in Bombay had in mind to establish.

The first paper in the Report is appropriately the excellent one prepared by Professor V. G. Kale of the Fergusson College, Poona, in which he made a ‘Twenty-five Years’ Survey of Indian Industries’ (pp. 61—74). It is full of statistical information clearly arranged and lucidly explained, and amply repays perusal. In a paper read before the Industrial Conference of Western India held at Poona in 1893, that great man who shed lustre on the Indian name, Mr. Justice Ranade, instituted a comparison of the trade returns of the year 1892-3 with those of fourteen years

* Printed at the end of this volume.

previous, and from a general survey of the nascent industries, he came to the hopeful conclusion that the transition of India from a purely agricultural to a partly manufacturing and trading country had commenced, and that the outlook, on the whole, was decidedly cheerful and promising. Fifteen years having elapsed since this happy prophecy was made, Mr. Kale felt that a similar retrospect might be taken. And well has he done his task. Having passed under brief review the chief industries of India and remarked on their present condition, Mr. Kale sums up his impressions in the following passage :—

‘The general impression left on the mind after a study of all the facts and figures given above, is that while we have been making, during the past twenty years, very gratifying progress in the manufacture of cotton and jute in the working of coal and gold mines, in the plantations and the kerosene industry, we have been marking time as regards sugar refining, oil pressing, iron mining, paper making, wool and silk manufacturing; and in the matter of glass, leather, umbrellas, metal manufactures, stationery, carriages, etc., we are almost nowhere. It is in the direction of these that we have now to make our way. That India yet remains a large field for producing raw materials for foreign manufacturing countries is no doubt true. But the opposite tendency which commenced thirty years ago is gradually gaining strength, and during the last five years the industrial problem has become the predominant factor in the public activities of the day.’

‘On the whole, though the goal is yet far off, we are to-day much nearer to it than we were fifteen years ago. Whether we look at the number of mills and factories, or at the amount of capital sunk in the industries, or the number of hands employed in them or at the spread of scientific and technical knowledge, or at the demand for Indian goods, or the interest taken by the people at large in matters industrial, from whatever point of view we look at it, we arrive at the same conclusion, viz., that we are making fair progress in the path of industrial development, and that we need not be disheartened by a few failures which are inevitable in the beginning.’ (Pp. 73-4.)

Dr. Morris W. Travers, F. R. S., Director and Professor of Chemistry, Indian Institute of Science, Bangalore, contributes a suggestive paper on ‘The Education of Persons who intend to make Scientific Investigation to take part in Industrial Development’ (pp. 75-9). About the training of the workman Dr. Travers says nothing beyond reiterating the opinion that it is necessary to provide him with general education, training in drawing, etc., and in the use of modern tools and appliances.

He confines his remarks to the education of those on whom the development of industries really depends, *viz.*, owners and managers of works. He has first some criticisms to make on the subject of Indian education in general. He points out that while at the Matriculation stage the Western student has generally some knowledge of the outlines of one or two European languages in addition to his mother tongue, the Indian student may be well acquainted with English, but he is often able to carry on conversation in that language only with difficulty, and he has no knowledge of other European languages.' 'As a first step towards success in an industrial career, an Indian student should acquire a thorough knowledge of English, and if possible a working acquaintance with French or German, preferably with the latter.' The science teaching now in vogue in high schools is as a rule 'worse than useless;' while as regards the B.A., or B.Sc., even, 'his knowledge of the theoretical side of any branch of science will be about equivalent to that which his confrere should attain one and a half years after matriculation, and in the majority of cases he will hardly have done any practical work at all.' Among 'the reasons for the backwardness of the Indian student in general,' Dr. Morris Travers mentions the 'altogether unnecessary amount of time' which 'is taken up in working for and passing examinations' and the fact that 'the time which the Indian student devotes to the acquisition of knowledge is very much less than that occupied by his Western confrere in actual work.' He favours 'the removal of institutions devoted to higher educational work to localities possessing favourable climates.' 'It is perfectly useless to pretend that a student who is able to get through less than half the work which he could accomplish in a favourable climate can compete with a man who has worked under European conditions.' A study of chemistry and the allied sciences and of mechanical engineering would be a suitable course to any one intending to attach himself to any of the commoner Indian industries.

'He would study chemistry, physics and mathematics during the first two years at college, together with English, which should be taught from the practical standpoint. Laboratory work should be an important feature of the course. During the latter two years he should devote himself mainly to chemistry, attending courses of instruction in machine drawing and strength of materials. He might then proceed to specialise

at the Indian Institute of Science, taking advanced courses in pure and applied science, and fitting himself to cope with the problems of the branch of industry which he intends to make his life-study.' (P. 79).

In the next paper Major W. V. Scudamore, R.E., Principal, College of Science, Poona, discourses on 'The Education of Engineers in the Bombay Presidency.' Major Scudamore considers at the outset the position of the Civil Engineer when he enters his profession in India. The engineer has to learn to exercise, to a most peculiar extent, the faculty of self-reliance. He has very often to be contractor and engineer rolled into one. All the needed qualifications cannot be entirely attained in a course of instruction in a college, but the teaching staff, if efficient and competent, will not fail to bear in mind, from start to finish, the object of the training they are giving. 'One weak spot in the present system of education in the Bombay Presidency seems to be that, as far as Engineering is concerned, too great importance is attached to the results of the University examinations.' Suggestions are made in the paper to remedy the evil.* According to the writer a striking point in connection with the subject under review is that it never seems to have been brought home to the minds of the general public that the profession of Engineering is deserving of any public support in the way of financial aid by the well-to-do classes resident within the limits of the Bombay Presidency.' Major Scudamore thinks that 'in a country like India, it is of the most distinct advantage to the whole community that large public works should be carried out by reliable firms of contractors and the head of such a firm ought to be a qualified engineer.' Two subjects which deserve attention are Architecture and Chemical Engineering. Major Scudamore sums up the chief requirements of the situation as co-operation by employers of engineers and a display of more public spirit by the well-to-do classes in affording financial aid.

Mr. Lalubhai Samaldas, a name intimately associated with the Conference, discusses the problem of 'Agricultural Indebtedness.' (Pp. 85—92.) The paper is written with the object of having the question discussed from a non-official standpoint, so that it may prove of some use to the Registrars of Co-operative

* *Vide* 'Summary of Proposals.'

Credit Societies when the matter is brought up before them at their next Conference. The main points that require to be considered in connection with the question are, (1) are the agriculturists so very much indebted that it is necessary to treat their case as a special one? (2) if the first question is answered in the affirmative, is it better to tackle the problem either by legislation and executive orders, or by arbitration and the exercise of moral pressure? (3) the methods of finding funds for paying off to the creditors the amount settled according to the procedure that may be adopted with reference to (2), and (4) whether the agriculturists should have the liberty to run into debt after the existing debts have been liquidated. Mr. Lalubhai's conclusions are that the agriculturists of the country as a whole are so hopelessly involved that some measures of relief are absolutely necessary; that Government should tackle the problem as early as possible; that the passing of an act like the Deccan Agriculturists' Relief Act for all the provinces will not suffice for a solution of the problem; that a combination of such legislation with a plan for the settlement of the amount of debts by non-official conciliators as in the Central Provinces, is likely to prove successful; that a large central bank with powers to deal both with Co-operative Credit Societies and with individuals is a necessity of the situation, and that such bank can be started by Indian agency and financed by capital available in the country. For Mr. Lalubhai's arguments in support of these conclusions, and for other points made by him in the course of his able discussion of the subject, the full text of the paper will have to be perused.

The scheme of a central bank referred to in the foregoing is discussed at greater length in the paper contributed jointly by the Honourable Sir Vithaldas Thackersey and Mr. Lalubhai (pp. 137—42). The principal features of the scheme are: (1) The Society to be a Co-operative Urban Society to be registered under the Co-operative Credit Societies Act, the share capital to be obtained in the open market; (2) share capital at present to be five lakhs, with power to increase it to 25 lakhs; (3) the Society to be authorised to issue 4 per cent. debentures to the extent of four times of its paid-up capital and reserve fund; (4) the interest on these debentures to be guaranteed by Govern-

ment until payment ; (5) debentures to be repayable at the end of 28 years.

Mr. H. R. Crosthwaite, I.C.S., Settlement Officer, Jubbulpore, has an instructive paper entitled 'An Introduction to Co-operative Credit' (pp. 93—115), which is well worth study. Mr. Crosthwaite has 'found that a middle course between the ideals of Raiffeisen and the practical but somewhat uncompromising system of Schulze Delitzsch is best suited to those districts of the Central Provinces' with which he is acquainted. According to him, 'no rural society in India can be a success unless it entirely fills the place which the money-lender occupies towards his clients.' This is a very important point. Mr. Crosthwaite agrees with other qualified observers in insisting on the liquidation of all old debts of agriculturists ; for he has known cases in which a hostile money-lender has put his debtors into court the moment they became members of a co-operative credit society. Another shrewd observation is that co-operative credit societies by themselves are not a panacea for poverty. In forming a society, he would 'make the fact plain that the formation of the society means the severance of the members of the society as *individuals* from existing or future financial relations with money-lenders. The state is to be wiped clean as regards existing debts which are to be paid off at once out of the funds of the society and in future no loan is to be taken otherwise than from the society.' Mr. Crosthwaite is equally clear that 'it is in the organisation of a proper and complete system of Central Banks that the future of co-operative credit finance lies.' There are such institutions in England and Germany. Another opinion of his is that 'no scheme of co-operative credit will succeed unless it be a practical scheme in which the capitalists of India are willing to co-operate.' And he shows that the co-operative credit movement does not oppose the interests of the capitalist but tends to supplement his operations by various means.

The next paper is on the same subject. In it Mr. W. H. Buchan, I.C.S., the Registrar in Bengal, deals with the problem of organisation (pp. 115—25). 'Expressed in a word, the paramount need of agricultural India is the provision of a cheap and easy credit, hedged round by safe-guards against its too easy abuse. The remedy, while supplying cheap capital, must enforce

thrift and self-reliance, or the latter end of the ryot will be worse than the first.' After explanation of the essential principles which must be borne in mind in the formation of co-operative credit societies, and reciting figures which illustrate the progress made in Bengal, Mr. Buchan tells us, what is only too true, that 'so far we have done no more than touch the fringe of agricultural indebtedness.' The problem to be solved before the movement can achieve its objects is 'organisation for the purpose of finance and control.' Mr. Buchan has much that is helpful to say on this matter. He concludes by saying: 'Above all things, we require helpers. Government can do little more than show the way. Co-operation, if it is to be a power in the land, must be developed by the people themselves.'

Mr. R. Raniachandra Rao, the Registrar in Madras, gives a brief account of the 'Credit Institutions in the Madras Presidency' (pp. 126—9). These are *Nidhis*, *Chit* Associations, Provident Funds, and Co-operative Credit Societies. The *Nidhi* is unsuited to the agriculturists who cannot make regular payments every month. 'As a general instrument of credit, the *Chit* fails and can only serve special persons under special circumstances.' The Provident Fund works, in general, 'as a swindle, moral if not legal, inasmuch as the people are induced to join in the erroneous hope of deriving benefits, in excess of their contribution.' There remain the co-operative credit societies. Their 'area of operations is small, the transactions are limited'; all the same, 'the credit institution of the future is the co-operative credit society.'

Mr. M. Shama Rao, the Registrar in Mysore, gives an account of 'Agricultural Banks and Co-operative Societies in the Mysore State' (pp. 130—7). The agricultural banks started in 1894 failed and were wound up. At present it is co-operative credit societies such as are found in British India, which are started, and these we are told give promise of success. It is interesting to learn that the need of a central bank for granting large loans to the rural societies has been recognised in that State too, and that it is in course of formation.

Rai Bahadur Lala Baij Nath, who in his retirement is able to bestow even more attention on industrial questions than when he was in service, supplies a deeply interesting account of 'The

Indian System of Banking and other Business' (pp. 143—58). He reminds us that the Hindus have always been expert accountants and that their system of accounts has always commanded the admiration of foreigners. During the Mahomedan regime Hindu accountants were always employed in all treasuries and account offices. The present system of Indian book-keeping is said to be due to Todar Mal's initiative. Rai Bahadur Baij Nath writes at length on the Indian shorthand, business education, the system of doing business, money-lending, book-keeping, the Indian broker, accuracy of accounts, *Sattas* and trades associations. The writer says that 'everywhere in Indian banking and business circles, there is now felt a dearth of good and reliable accountants and many a graduate now pining for employment, will at once increase his opportunities of earning a decent and honourable livelihood, if he but learnt the Indian system of accounts and book-keeping.' He is of opinion that 'the Indian system of book-keeping is certainly more accurate and less complicated than the European system and can easily be learnt by the most ordinary intellect.' He describes and condemns *Sattas* and urges that every effort should be made to stop this species of gambling. He urges educated Indians to take to trade as 'experience shows that wherever men of education have gone into business and done it with patience and honesty they have always been successful. The field is still open and if men of no education get rich in a few years, there is no reason why those who are educated should not do so.'

Writing on 'The Problem of the Indigenous Workman' (pp. 158—62) Mr. A. Tellery of Benares suggests that 'it would be a most interesting return which would tell us how many workmen were in these schools (the Schools of Art) during the last ten years and received a practical training in the technique of their respective arts which enabled them to turn out superior work.' The following picture will generally be regarded as true to life :—

'There are no openings for all the men who leave colleges and schools as passed or failed men. They are intelligent men who could earn a decent living at some useful trade or industry if their education had not been so one-sided and literary. Face to face with poverty, family obligations, their caste requirements, and an increasingly keen struggle

for existence, and withal with no means open to them of earning their livelihood, the lot of the middle class Indian is as pitiable as that of the humbler toiler in the field and in the cottage.'

The remedy suggested is that an essential part of the education of the youth of India should be some amount of mechanical training.

In the succeeding paper Mr. N. Pattabhirama Rao, late Dewan of Cochin, writes on 'The Government and Industrial Development' (pp. 162—9). Mr. Pattabhirama Rao is of opinion that

'Constituted as the British Indian Government is, its responsibility in regard to matters concerning the well-being of the population is much greater than in the case of a Government in which the people have a voice in the management of the public revenue and the framing of its fiscal laws...it is incumbent on it to interest itself more directly and actively in matters in which under other circumstances the initiative need not necessarily proceed from that source.' (p. 163.)

Towards the conclusion of his paper Mr. Pattabhirama Rao vigorously combats the view of 'some who consider that industrial instruction must follow the establishment of industries.' He says that this 'is like waiting to get into water until learning the art of swimming. For starting an industry there must be one with the requisite knowledge available.'

After this come a number of papers dealing with particular industries. And Messrs. M. R. Ramakrishna Iyer, Secretary, Tinnevely Agricultural Association and an informed and practical enthusiast in the matter of agricultural improvement, and D. Clouston, Deputy Director of Agriculture, Central Provinces, lead off with two papers on improvements in Agriculture, the greatest and most indispensable of industries, in their respective provinces. Mr. Ramakrishna Iyer's paper (pp. 319—86) is a very long one of 67 pages, and one deserving and requiring very close study. It is crammed with the most useful information and may be considered a small treatise on the subject. It is obviously out of question to do anything like justice to such a paper in the course of a brief summary. The object of the farmer is 'to raise from a given extent of land the largest quantity of the most valuable produce at the least cost, in the shortest period of time and with the least permanent injury to the soil; the rearing of stock in the most efficient and economical method; and the production

of dairy produce.' Mr. Ramakrishna Iyer deals as exhaustively as the limits of even a very lengthy paper permit, with ploughing and different kinds of ploughs, harrowing, conserving moisture, manuring and different varieties of manures, sowing and the growth of crops, transplantation, seed selection and breeding, etc., and then passes on to the several kinds of crops grown in Southern India beginning with paddies and including all other food crops, oil seeds, tobacco, fodder crops; he discusses, too, rotation of crops, irrigation of crops, improvement of soils, drainage, plant diseases and insect pests, cheapening of fuel, and lastly, the education of the ryot population. He also brings in the efforts which are being made in Japan and America. He wants educated men to take to agriculture as an occupation, and concludes his valuable essay by appealing to the Government to be liberal in their help for the advancement of the great cause, which is the cause, at the same time, of both the people and the State.

Mr. Clouston in his paper (pp. 170—5) is hopeful for the future :

'There are many incentives to good work; the Local Government is most anxious to do everything within its power to further the interests of the ryot; the ryot himself, though often poverty-stricken is so patient and uncomplaining in the midst of his hardships, and so grateful for help received that the scientific worker among them cannot help feeling that it is his bounden duty to minister to the wants of this most deserving class in every way possible. The ryots of these Provinces are now beginning to appreciate the work that is being done for them and to regard the Department as their friend.' (Pp 171-2.)

Says Mr. Clouston further :

'As the result of its demonstration work in this (the Raipur) division during the last year, the Department has induced the cultivators to transplant about 1,300 acres of rice and to irrigate 800 acres of wheat, where the transplanting of wheat and the irrigation of wheat were quite unknown before. That these improvements will be generally adopted, and that the profits of the farming community of this tract will go on increasing enormously is certain. The introduction of the better varieties of sugar-cane in the tank irrigated—areas of this tract is at present being pushed and will in a few years add very considerably to the wealth of this part of these Provinces. Not the least important of the improvements introduced by the Department is the intelligent interest in farming which it has awakened among cultivators in these Provinces. This is a most pleasing and satisfactory feature of its work.' (Pp. 174-5.)

There are two further papers relating to agriculture. One is on 'Irrigation by Pumping, (pp. 176—203) by Mr. Alfred Chatterton, who has done so much to further it in the Madras Presidency. This paper is complimentary to the one contributed by him to the Surat Conference.* Mr. Chatterton observes that one of the many difficulties which have to be faced by those who are striving to improve the economic situation in the South of India is the high price which has to be paid for fuel. He thinks it would be almost a fatal error to build up an industrial system in Madras based on foreign sources of fuel supply and the oil engine should be regarded as a temporary expedient which must ultimately give place to engines using gas.' Mr. Chatterton is able to say that 'the movement in favour of employing mechanical means for lifting water is making rapid progress.'

'In April 1905 eleven oil engines were at work, in 1906 thirty-five engines, in 1907 fifty-four engines and in 1908 ninety-four engines, whilst at the present time (December 1908) it is probable that there are about 150 engines either actually pumping or in course of erection.' (P. 178).

Mr. Chatterton supplies details of working of thirteen of these installations, which show that all of them are remunerative. He tells us that for every ryot who owns a pumping installation there are at least a hundred who would be glad to have one but who have not the means therefor.

'I have reason to believe (says Mr. Chatterton) that there is room for many thousands of such installations in the Coast districts and on the margins of many of our rivers. Their influence on agricultural development is already considerable and not a few are regarded in their own neighbourhood as model farms. The results obtained in them have awakened a new interest in well cultivation, and throughout the Presidency there is a growing demand for the exploration of the sub-soil with boring tools. The demand is for a perennial water-supply which will enable irrigation to be carried on all the year round so that more valuable crops, which require to be on the land for a long time, may be cultivated.' (P. 196).

The next paper is by Professor J. B. Knight of the Poona Agricultural College, and deals with the practice of using cowdung as fuel (pp. 203—5). Its purpose is to find out exactly what is our loss by this practice and to see if there is no remedy for it.

* 'Lift Irrigation' by Alfred Chatterton, Esq. Pp. 122—50, Report of the Third Indian Industrial Conference.

The loss is at least five rupees a year in every Rs. 25 spent on cow-dung cake for use as fuel instead of kerosene oil.

Mr. P. Ray Chaudhuri of Calcutta supplements the paper contributed by him to the Surat Conference* by one on 'Exposition and Extraction of Oil' (pp. 205-44). He incorporates in it estimates which he obtained from the pioneer engineering firms of Calcutta and other places which deal in oil machinery. This information will certainly be useful to those who mean to start oil mills. Readers of the paper will, we have no doubt, concur in Mr. Ray Chaudhuri's opinion 'that this industry is still in its incipient stage in our country, that it has a very bright future before it' and that vigorous efforts should be made to develop it.

With the above paper should be read Rao Bahadur D. V. Bhagavat's 'A Few Hints for the consideration of those who may intend to establish new Oil Mills' (pp. 253-7). Mr Bhagavat is in the business himself and his paper is thoroughly modest and practical like its author. He points out that 'the business of an oil-miller...partakes largely of the nature of speculation...because it is necessary for him to buy and store oil seeds in advance to last for several months,' for reasons explained in the paper, 'The same considerations more or less apply to the products of his mill, viz., oil and cake. The latter is almost all exported to foreign countries where it comes into competition with the products of other countries. As for oil, it is almost subject to great fluctuations of prices. Thus an oil miller is largely the victim of fortune.' In the case of an oil mill of the smallest size capable of being remunerative, about Rs. 50,000 will be locked up in seed alone and another Rs. 30,000 to 40,000 in stocks of oil, cake, stores and outstanding debts. 'Other causes which may account for failure are insufficient equipment in machinery and plant, buildings and stores.' The practical hints which Mr. Bhagavat makes deserve to be taken to heart by those in the business.†

We have next to call attention to an excellent paper by Professor E. R. Watson of the Dacca College entitled 'An

* 'Oils and Oil-seeds' by P. Ray Chaudhuri, Esq. Pp. 247-69, Report of the Third Indian Industrial Conference.

† *Vide* 'Summary of Proposals.'

Opening for Small Dye—Works in Bengal' (pp. 244—53.) 'Having had occasion to consider the question as to what chemical industries would stand a chance of successful development in Bengal,' Professor Watson has 'formed the opinion that at the present juncture the dyeing industry carried on in comparatively small factories offers every prospect of considerable success' At present practically all the dyed goods used in the province are imported from Europe. The Calcutta import trade in dyed yarns, dyed and printed cloths, is enormous'. Several Bengal mills are extending their operations in the direction of producing dyed goods. But in so far as these are run by European capital, the development does not, Professor Watson believes, possess much interest for Indians as their managers 'do not show any tendency to employ Indians in positions of responsibility or for any work except mere labour.' As the class of Indians who have come to take a keen interest in industrial development do not ordinarily possess large capital, 'any industry which offers a prospect of successful development in small factories with only a small capital outlay is of special interest at the present time.' And Professor Watson sets out to show 'that the dyeing of yarn and cloth and calico-printing could be taken up with success...in small factories with a capital of not more than from Rs. 50,000 to Rs. 1,00,000.' And he expresses the hope 'that in the near future the Government of Bengal may start classes in Dyeing and the Chemistry of Dyeing and may also attempt a demonstration of the feasibility of small dye-works by itself starting such a small factory.' Professor Watson enters into calculations the result of which is that from 18 to 24 per cent. profit can be made out of a small factory with Rs 50,000 capital. He urges the Government to get

'Together a collection representing the chief classes of goods which find a market in this country together with detailed information as to the demand which exists for each class of goods and the prices at which they sell. I believe that in other countries, *e.g.*, in Japan, a Government Department not only collects such information with regard to the home trade but is at considerable pains to place at the disposal of manufacturers the most detailed information as to the class of goods likely to find a profitable sale in foreign markets.' (P. 251.)

Professor Watson has 'absolutely no doubt that artificial dye-stuffs from Europe would be required,' as in his opinion 'the

vegetable dyes of India are, with very few exceptions, incapable of giving really fast colours on cotton.' A man to qualify himself to start a dyeing factory has to go to a foreign country for training.

Mr. J. N. Banerjee of Calcutta in a short note on 'The Aloe Fibre Industry' (pp. 257—60) draws attention to the case with which 'we can amass a large fortune at a trifling cost' by taking to this industry.

We pass on to Mr. Percy Brown's paper on 'The Artistic Trades of the Punjab and their Development' (pp. 260—7). Mr Brown writes from personal knowledge and has much that is interesting as well as suggestive to say of the instruction imparted by the Mayo School of Art, Lahore, of which he was till lately the Principal, and of the state and prospects of carpet manufacture in the Punjab.

In the paper that follows Dr. M. C. Nunjunda Rao of Madras discourses on 'Home Industries for Indian Women' (pp. 268-79). The writer has been practising what he preaches, for his own girls usefully engage themselves in some industry or another such as knitting, sewing, hosiery, carpet-making, etc. We learn from Dr. Nunjunda Rao 'that over one thousand families in Japan employ their leisure hours in the production of hosiery and supply not only the local demand but export them to foreign countries.'

'Among the numerous trades which may be successfully and profitably introduced as home industries may be included the knitting of socks, neck-ties, woollen caps and small banyans by means of small and cheap knitting machines, crochét work, sewing, needlework, including embroidery braid, tape and lamp wick making, palm leaf weaving, making of window chinks with stencil painting, cane and reed work, wads, curtains, etc.' (P. 273.)

Dr. Nunjunda Rao cites instances where daily profit has been made by the practising of the above by women at home. Carpet weaving is less profitable but interesting as an occupation. Dr. Nunjunda Rao rightly speaks of the necessity of girls being educated, if home industry is to become a success. He thinks it 'extremely important that drawing and clay modelling should be systematically and compulsorily taught in our schools and one hour a day devoted to manual training both in boys' and girls' schools.'

Mr. C. E. Low, I.C.S., to whose untiring exertions the success of last year's Exhibition at Nagpur was so greatly due, supplies an interesting account of it, which organisers of exhibitions should study. (Pp 279—99.) The general policy laid down ..was to show the Central Provinces what the rest of the world could do for them and to show the outside world what prospects the Central Provinces could offer to investors. Of the value of joint work by officials and non-officials, Mr. Low says :

'The officials depended on the non-officials for their knowledge of popular sentiment, of trade requirements and all the arrangements necessary for the convenience of the exhibitors, while they in their turn, were able to help the non-officials by pointing out to them the most convenient and business-like ways of organisation. In the fullest sense it is true to say that neither class could have succeeded without the assistance of the other. The Exhibition owes its punctuality, promptitude and system, important things enough in their way, to its official helpers, but to its non-official members it owes what is even more important ; its representative character, its picturesque arrangements and decorations and the popular interest taken in it throughout the Provinces.' (P. 286)

The greatest success was achieved by the Agricultural Department. 'It was the general opinion of visitors, that never had an agricultural exhibition been so efficiently conducted in India or on so extensive a scale, and with the prospect of so much real benefit to visitors.' In the Miscellaneous section :

'The most important exhibits were numerous displays of small Indian manufactures, such as buttons, brushes, combs, matches and other industries which have sprung up during the last four or five years. The pluck and enterprise which the apparent success of these industries showed, struck every one very forcibly.... There is good reason to hope that the success of these smaller industries, which seems very hopeful, may shortly lead capitalists to make somewhat wider ventures in directions which are likely to lead them to even greater financial success.' (P. 289.)

'What is the practical use of holding an exhibition?' Mr. Low 'can point to several matters where the recent Central Provinces and Berar Exhibition will be of definite assistance to workers in the industrial field.' The use of the Agricultural Section no one, he thinks, will venture to question. 'Tens of thousands of cultivators have seen the improved machines in actual operation and have purchased large numbers of them.' As regards the Industrial Section, Mr. Low thinks 'that the case is at first sight less clear' but is able to point to 'definite and pal-

pable ends obtained by individual classes of exhibits' And besides,

'There is the general but undeniable effect on the Indian industrial world of such an Exhibition just at present. Everything is valuable that tends to emphasise the industrial self-consciousness of India; that will show capitalists to what an extent and with what success small industries are being carried on over India; that will encourage the small and struggling manufacturer with a sight of what his brothers and rivals are doing in other parts of the country; that will enable all interested in the industrial regeneration of India to point to the outside world the result of their economic stock-taking and to challenge denial to their claim that real and substantial progress has already been made and that hopes of even better things are to be found therein. Finally the educative effects on so backward a people as those of the C. P. must not be overlooked. The imbibing of new ideas always produces greater receptivity for still newer ones;...' (Pp. 298-9.)

The last paper is by Mr. C. Gopal Menon of Madras on 'The Industrial Ascendancy of the Nations' (pp. 300—19). He takes us through the causes which have operated to bring about the present highly satisfactory condition of Germany and other countries, and, in the efforts now being made in India for industrial development, exhorts the people carefully to examine the different methods employed by other nations, and especially those of the West and study their present state in order to avoid mistakes.' In conclusion he says: 'Especially banking and finance are a science which must be closely followed and practised, just as any other science. The time and pains that one bestows upon them will be amply rewarded'

Mr. D. E. Wacha moved the first resolution in which the Government of the several provinces were urged to establish separate Departments of Industry. The second resolution on Technical and Industrial Education was moved by the Honourable Pandit Madan Mohan Malaviya and seconded by the Honourable Mr. Gokuldas K. Parekh. On this subject there was a speech by Professor B. Heaton, Principal of the Sibpur Engineering College who gave an interesting account of the steps being taken in Bengal to further technical and industrial education. Professor H. B. Lees-Smith of the London School of Economics and Political Science, who came to India at the instance of the Government of Bombay to deliver a course of lectures on Commerical Education, attended the Conference and made an interesting speech in

support of the third resolution, which was on Commercial Education. Professor Lees-Smith said :

‘If you are going to take into your own hands the control of the commerce of this nation, then you must produce wide-minded, enterprising men of initiative, men who are likely to be produced by the University Faculties of Commerce. Now, there is one point which I shall make clear, and that is that the training in a University Faculty of Commerce is not divorced from the practical life of business. The University Faculty of Commerce is intended, of course, to train the judgment and to mould the minds of men. It is claimed that, although it must give primarily a liberal education, it is possible to give that education which has a direct and practical bearing on business life. I am not going through the curriculum, but just imagine to yourselves a young man of the age, say, of 21. If he has been an intelligent student in a Faculty of Commerce, that young man at that age will be able to enter into the most intricate financial discussion. He will be able to follow the fluctuations in the foreign exchanges and to analyse the reasons for them. He will understand the organisations of all the great industries. He will be able to write a good business letter in English and one other foreign language. He will have to study the sciences which bear upon the industries in which he is likely to be engaged. He will have examined all the tariffs, of different nations as also their trade. I claim, although such a man has never been a day in an office, he will have at the age of 21 an amount of knowledge which an ordinary business-man is only able to obtain after years and years of experience. He will understand scientifically many of those phenomena which ordinary men of commerce only understand dimly, because they have never entered into the reasons behind them. That kind of man has immense possibilities in the world of commerce. He is the kind of man on whom you must depend to lead you in the industrial march in the future. On him you must depend to free you from the domination of employers and capitalists of the British race.’ (Pp. 413-4).

The fourth resolution which was on agricultural banks was spoken to by Mr. Lalubhai Samaldas. The fifth advocated the repeal of the excise duty on Indian cotton goods. The sixth urged an enquiry into the incidence of railway rates and was in charge of Dewan Bahadur Ambalal Sakerlal Desai. The speech of the Honourable Sir Vithaldas Thackersey on the seventh resolution, which urged the people to form joint stock companies for the development of the mining, textile and sugar industries, gave rise to an animated discussion in which Mr. G. Subramania Iyer, the Honourable Mr. H. S. Dixit and the President, took part. The point at issue was the place of sentiment in the move-

ment for the development of industries. If Sir Vithaldas spoke more like a businessman, and Mr. Subramania Iyer more like a patriot, it did not mean, as the President pointed out, that the former was lacking in the latter quality or that the latter did not attach any importance to business capacity. The discussion was distinctly interesting.

Thus ended the proceedings of the Fourth Indian Industrial Conference which, as we stated at the beginning, was an unqualified success.

SUMMARY OF PROPOSALS.

A. The Work of the Conference.

1. The Conference and the organisations affiliated to it should establish scholarships to be granted to one or two weavers from each of the different weaving centres so that they may learn the use of new looms, and they should be presented with a loom like the Sayaji Cottage Loom, the working of which they should show to their fellow-craftsmen and teach any one wishing to learn. (*Rao Bahadur R. N. Mudholkar*, Pp. 35-6.)

2. It is now necessary to create local organisations which will take charge of actual work, form companies, promote the establishment of manufacturing and commercial concerns and create general industrial activity. (*Ibid*, p. 55).

B. Investigation.

3. A complete and fully elaborated plan of operations should be drawn up for each province nay for each district. The existing industries which are capable of improvement, the decadent ones which can be revived, the new ones which can be established, should all be noted down in due order of importance and prospect of immediate success, the localities suitable, the most efficient appliances and methods, the minimum capital required for a paying concern, the sources and cost of labour should all be stated. (*Rao Bahadur R. N. Mudholkar*, Pp. 53-4.) Committees should be appointed in every province to go thoroughly into this industrial question and prepare schemes of work which can be carried out. These are to be laid before Government for action to be taken. (*Mr. A. Tellery*, p. 162). Take stock of existing industries ; next, select such of them as are deserving of encouragement, and lastly, subject them to investigation and study so as to discover what their weak points are and how they may be remedied. (*Mr. N. Pattabhirama Rao*, p. 163.)

C. Education.

4. A properly equipped Institute of Technology and Research should be established by Government in the various

provinces. (*Dewan Bahadur P. Rajarathnam Mudaliar*, p. 7.) A dozen at least of high class technological colleges where the highest technical instruction will be given in (a) mechanical, electrical, mining, railway and marine engineering ; (b) in textile manufacture ; (c) in mining chemistry and metallurgy ; and (d) in the numerous departments of industrial chemistry, completely equipped in every respect. (*Rao Bahadur R. N. Mudholkar*, Pp. 47-8.)

5. Pending the establishment of a College of Technology in Madras, a certain number of workshops should be established, which would enable the Government to train skilled mechanics qualified to give manual training in industrial schools. (*Dewan Bahadur P. Rajarathnam Mudaliar*, p. 9.)

6. A Faculty of Commerce should be created in the University of Bombay, with affiliated colleges in cities like Bombay itself, Calcutta and Cawnpore. (*Rao Bahadur R. N. Mudholkar*, p. 48.)

7. Our merchants should endow commercial colleges in the absence of Government institutions. (*Mr. K. Subramani Aiyar*, p. 409.)

8. Secondary technical and industrial schools in each division and elementary crafts schools in each district, represent our minimum requirements in those courses. (*Rao Bahadur R. N. Mudholkar*, p. 48.)

9. General elementary education should be provided free by the Government and the Local bodies. (*Ibid*, Pp. 48-9.)

10. Drawing and manual training must form a necessary portion even of the literary course. The teaching of science must be far higher and far more general than at present. (*Ibid*, p. 49 ; and *Mr. A. Teller*, p. 162.) In order to create in our younger generation a taste for scientific learning and practical work, the present system of education should be modified so as to give prominence to manual and mechanical instruction in the curriculum of general studies. (*Mr. N. Pattabhirama Rao*, Pp. 168-9.)

11. As a first step towards success in an industrial career, an Indian student should acquire a thorough knowledge of English, and if possible a working acquaintance with French or

German, preferably with the latter. (*Dr. Morris W. Travers*, p. 76.)

12. The time occupied in the merely theoretical science teaching of a candidate for the matriculation should be devoted to English, Mathematics or subjects in which genuine instruction can be given. (*Ibid*, p. 76.)

13. Institutions devoted to higher educational work should be removed to localities possessing favourable climates, in order to enable students to do more work as well as for their moral and physical well-being. (*Ibid*, p. 77.)

14. It is of importance that the would-be leader of industry should either possess capital or should be connected with those interested in industrial undertakings. (*Ibid*, Pp. 77-8.)

15. A man must be in a position to set aside caste prejudices, must be ready to undertake rough work, and to work at all hours and under all conditions irrespective of any agreement which he may look upon as defining and circumscribing his duties. (*Ibid*, p. 78.)

16. It would be to his great advantage if during the vacations he were enabled to gain some experience in the business side of the undertaking to which he would afterwards be attached. (*Ibid*, p. 78.)

17. A knowledge of English is also essential and it would be to the student's advantage if at an early stage in his career he were to take in, and read, one of the leading English journals dealing with the industry in which he happened to be interested. (*Ibid*, p. 78.)

18. Arrangements should be made to permit students of this type to enter on a course of study suitable to their requirements...A knowledge of chemistry and the allied sciences, and of mechanical engineering, would form a suitable course to any one intending to attach himself to any of the commoner Indian industries. (*Ibid*, Pp. 78-9.)

19. Modified responsibility for work should be placed on the shoulders of the engineering student while at college. (*Major W. V. Scudamore*, p. 80.) A comprehensive scheme to ensure the Sandwich system of practice and theory is eminently desir-

able. With this end in view, the co-operation of working bodies and firms is a *sine quâ non*. (*Ibid*, p. 84.)

20. In Engineering it is essential that a student's knowledge of certain things should be tested by a practical examination. A carefully kept set of laboratory notes can, however, be minutely scrutinised from time to time by the college staff, and these should be considered in the final examination in the awarding of marks. (*Ibid*, p. 81.)

21. Some sort of differentiation is required in the kind of education that is to be afforded, whether by Honours classes or complete separation of classes. (*Ibid*, p. 81.)

22. The public should come forward to assist the improvements that are being made in Engineering instruction. (*Ibid*, p. 83.)

23. By the generosity of the public a 'School of Mines' may suitably be inaugurated under the ægis of the Poona College of Science (*Ibid*, p. 83.)

24. Architecture and Chemical Engineering deserve attention (*Ibid*, Pp. 83-4.)

25. Give the Indian workman some education, equip him with some technical knowledge of his own art or craft. (*Mr. A. Tillery*, p. 160).

26. For the benefit of men who cannot attend classes in business hours, night classes should be opened, one in each *Mohulla* (ward) in cities and one in each village containing from 30 to 50 workmen. (*Ibid*, p. 161.)

27. There should be in each province a technical school at which higher training in artistic and other industries conducted on Western lines may be imparted. (*Ibid*, p. 161.)

28. The Government of Bengal should in the near future start classes in dyeing and the chemistry of dyeing. (*Professor E. R. Watson*, p. 245.)

29. A man who intended to start a small dye-works should first take a sound general education in this country, which should include some knowledge of science and engineering, and then proceed to Europe. There he should study first in some Technical College, as at Leeds or Manchester in England, and afterwards

gain admission to some dye-works where the operations could be seen as carried out with all the dispatch and economy necessary to ensure a profit. (*Ibid*, p. 252.)

30. The education of girls is necessary to fit them to take to home industry. Drawing and clay modelling should be systematically and compulsorily taught in both boys' and girls' schools. (*Dr. M. C. Nunjunda Rao*, p. 277).

31. In all rural schools, agriculture should have a prominent place, and instruction should be given in the elementary principles of the science, and facilities afforded for the boys to learn object lessons in agriculture as an art. A garden may be attached to each school (*Mr. M. R. Ramakrishna Aiyar*, p. 383).

32. At agricultural colleges and schools to which farms must of course be attached, there should be short courses for cultivators and for students who may be unable to take a degree but who are willing to undergo training for about a year (*Ibid*, p. 384).

D. Capital and Co-operative Credit.

33. Land banks similar to the Agricultural Bank of Egypt should be established, with the help and co-operation of local capitalists as an essential condition (*Rao Bahadur R. N. Mudholkar*, p. 29.)

34. Efforts should be made to make available for industrial purposes a portion of the capital now invested in Government Promissory Notes and Savings Banks by the formation of Joint Stock Industrial Banks and Joint Stock Companies, and also to obtain the help of foreign capital. (*Ibid*, p. 51.)

35. Government should tackle the problem of agricultural indebtedness as early as possible (*Mr. Lahubhai Samaldas*, p. 87.)

36. Legislation on the lines of the Deccan Agriculturists' Relief Act but making it compulsory in certain selected tracts, and leaving the settlement of the amount of debts in the hands of non-official conciliators as in the Central Provinces, is likely to prove a successful solution of the problem. (*Ibid*, p. 89.)

37. A large central bank with powers to deal with co-operative credit societies and with individuals will be in a position to

advance to the agriculturists the amount settled to be paid to the existing creditors. (*Ibid*, p. 90.)

38. The ryot's right to borrow on the security of his lands should not be restricted in connection with the scheme for liquidating his debts. (*Ibid*, p. 91.)

39. All old debts of ryots should be liquidated. (*Mr. H. R. Crosthwaite*, p. 100.)

40. A *minimum* of rules should be framed for a co-operative credit society. (*Ibid*, pp. 100 & 103.)

41. It is in the organisation of a proper and complete system of Central Banks that the future of co-operative credit finance lies. (*Ibid*, Pp. 104-5.)

42. No scheme of co-operative credit will succeed unless it be a practical scheme in which the capitalists of India are willing to co-operate. (*Ibid*, p. 109.)

43. In view of the large sums of money deposited in *Nidhis* (Madras), there should be legislation for compulsory external audit. (*Mr. R. Ramachandra Rao*, p. 127.)

44. Diffusion of knowledge of the methods of work of co-operative credit societies and considerable help from the non-official public in starting societies are required at present (*Ibid*, p. 129.)

45. In connection with the scheme of a Central Financing Society proposed at the Simla Conference of Registrars of Co-operative Credit Societies, co-operative credit societies might be formed where they are not in existence so that moneys might be lent to ryots through them. (*The Honourable Sir Vithaldas Thakersey*, p. 142.)

E. Fiscal Policy.

46. Moderate protective tariffs should be imposed to give a fair start to indigenous industries. (*Dewan Bahadur F. Rajarathnam Mudaliar*, p. 10.)

47. The Excise Duty on Indian cotton goods should be repealed. (*Ibid*, p. 11, and *Rao Bahadur R. N. Mudholkar*, p. 34.)

F. Railway Rates.

48. Reduction in railway rates should be secured by the Conference and the commercial community pressing for the inter-

vention of the Government. (*Rao Bahadur R. N. Mudholkar*, Pp. 51-2.)

G. Agriculture.

49. Travelling demonstrators should carry from village to village knowledge of the successful results achieved in the experimental and demonstration farms and actually show the operations to the villagers. (*Rao Bahadur R. N. Mudholkar*, p. 26.)

50. The numbers of such farms should be increased. (*Ibid*, p. 26.)

51. Branches of District Agricultural Associations should be established in every taluk and tahsil. (*Ibid*, p. 26.)

52. Larger allotments than have been made till now ought to be made by Government for extending canal irrigation. (*Ibid*, p. 27.)

53. In tracts of country where canal irrigation is not feasible the Government and the people should establish cheap lift irrigation. Wells should be constructed in the beds or on the banks of rivers and streams, and steam, gas or electric installations should be established for lifting water out of them and irrigating thereby millions of acres which at present depend only upon rain water. (*Ibid*, pp. 27-8.)

54. For improvement in the ryot's condition there should be (1) real practical education, which should be free; (2) supply of easily obtainable capital at reasonable rates of interest; (3) greater fixity of tenure and greater permanence in the land revenue demand; and (4) a more elastic land revenue collection system. (*Ibid*, Pp. 28-9.) A modified permanent settlement such as was recommended by Lord Ripon's Government is asked for. (*Ibid*, p. 31.)

55. The Agricultural Department should render assistance to the owners of pumping stations who have taken to 'lift irrigation' (*Mr. Alfred Chatterton*, p. 180.)

56. More irrigation in the south of India they must have. If water cannot be obtained at Rs. 5 an acre it can be at Rs. 10, and still larger supplies at Rs. 20. There is still a very wide margin for the irrigation engineer to operate on. (*Ibid*, p. 197.)

57. A good portion of the ryots should be made acquainted with the more obvious and primary principles applicable to agriculture. (*Mr. M. R. Ramakrishna Aiyar*, p. 321)

58. The landowners should by individual and concerted action try to introduce here those rational and improved methods of agriculture which have proved so successful in Western countries. (*Ibid*, p. 322.)

59. The improved plough should be employed to give the first two ploughings for fields wet or dry. (*Ibid*, p. 326.)

60. The *guntaka* of the Ceded Districts, a simple indigenous harrow being at once useful and cheap, should be introduced in all parts of the country where it is unknown. (*Ibid*, p. 327.)

61. A light wooden roller might, with advantage, be introduced for breaking clods and smoothing the surface for providing seed bed. The roller, the double mould-board plough, and a few other implements might be owned by a number of ryots in common. (*Ibid*, p. 328.)

62. Government should take steps to cheapen wood fuel, so that cow-dung may be reserved for manuring purposes. (*Ibid*, p. 340.)

63. Large landed proprietors should allot portions of their estates for regularly growing fuel trees with benefit to themselves and their country. (*Ibid*, p. 340)

64. Regard being had to the high value of oil cakes and bones as manures, the Government should, in the interests of agriculture, adopt measures to prevent or restrict their export from this country after making any enquiry that may be considered necessary. (*Ibid*, pp. 343 & 384.)

65. Having regard to its utility for reclaiming Usar soils the Government should take steps to place gypsum within the reach of the ryots at a moderate cost. (*Ibid*, pp. 344 & 374.)

66. Having regard to the importance of rice as a food stuff in this country, the Agricultural Department should carry on experiments. (*Ibid*, p. 352.)

67. For the purpose of raising seed every farmer should set apart a field (though small) and cultivate it with particular attention. (*Ibid*, p. 353.)

68. Capitalist farmers could make themselves highly useful to themselves and their country, if they would turn their attention to scientific farming on a commercial scale. (*Ibid*, p. 357.)

69. The Government should see that special attention is paid to the enlargement of tanks by the D.P.W. and the Revenue officers. (*Ibid*, p. 358.)

70. One important item of agricultural improvement is the introduction of new crops and new varieties of crops suited to each locality in addition to the improvement of existing crops. (*Ibid*, p. 358.)

71. The *durum* wheat, which matures in about four months and is to some extent drought-resisting, as well as suited to warm climates, should be introduced in this country so as to extend considerably the wheat-growing area. (*Ibid*, p. 358.)

72. The Northern provinces of India might grow oats which are said to be fit for harvest between 65 and 75 days. (*Ibid*, Pp. 358-9.)

73. Maize and potato should be more extensively cultivated than at present in the Madras Presidency, Queensland maize may by further experiments be found suitable to the Presidency. (*Ibid*, p. 359.)

74. Among other crops, some varieties grown in certain parts of India are superior to those found in other parts, and the superior varieties should be introduced in localities where they are till now unknown. (*Ibid*, Pp. 359-60)

75. Improvements which involve not only seed selection but hybridisation and plant breeding, as well as the introduction of foreign crops and varieties should not be undertaken by private farmers but must be left to the expert knowledge and guidance of the Agricultural Department. (*Ibid*, p. 361.)

76. As there appears to be a rising demand for the Deccan hemp for ropes, cordage, canvas, etc., and as the fibre itself is considered superior to jute and more durable, our farmers ought to be made acquainted with the value of the crop, so that it may be regularly cultivated by itself like any other crop. (*Ibid*, p. 362.)

77. The Department might try to introduce soy beans, acclimatised German peas and any other pulse known to possess

superior qualities. Tapioca or casava cultivation might be made to support an industry. Bananas or plantains might be raised on large and numerous fields in view to the manufacture of banana meal. (*Ibid*, p. 363.)

78. With regard to crops like tobacco, experts ought to be engaged on contract for teaching, explaining, and working out the various improved processes of cultivation and manufacture. (*Ibid*, Pp. 363-4.)

79. The Department of Agriculture in America has produced a variety of Alfalfa suited for hot climates and the Department here would be doing a good service by getting this foreign plant in our midst acclimatising it if necessary. (*Ibid*, p. 364.)

80. Government should consider whether more liberal rules cannot be framed in respect of grazing and the existing rules more liberally worked, providing greater facilities to the ryots without any real injury to the forests. (*Ibid*, p. 366.)

81. Instead of irrigation by spreading water over the surface of lands, what is called 'furrow irrigation should be adopted.' (*Ibid*, p. 369.)

82. The Government should provide at least two or three sets of boring tools for each district together with the establishment for having them worked. A nominal fee might be levied for the use of the tools, for trial borings, etc. (*Ibid*, p. 370.)

83. Information on plant diseases and insect pests should be widely disseminated by leaflets in the vernaculars and lecturing tours arranged to acquaint the ryots with the habits and mode of life of injurious insects and the means to get rid of them. (*Ibid*, p. 374.)

84. The Department should introduce birds, lady birds and parasites inimical to insects. For some time to come it should also provide our farmers, on payment of cost, with solutions washes, etc., for the destruction of pests as well as with the appliances for using the same. (*Ibid*, p. 375.)

85. Our farmers should not get any foreign seed unless under the advice and guidance of the Department. (*Ibid*, p. 375.)

86. Farmers should not grow a new crop or variety unless under proper advice and guidance. (*Ibid*, p. 381.)

87. Our educated classes should take to agriculture. (*Ibid*, p. 381.)

88. Agricultural associations should take steps for the introduction throughout the country of good practices prevailing in one part but unknown in other parts of the country. They should also have demonstrations given, in their several districts, of the improved agricultural implements which have been tried and found useful, and also by leaflets and otherwise disseminate information regarding new and improved cultural methods. The Associations themselves or some of the members might take up the cultivation of new crops and varieties which may have been tested and shown to be profitable. (*Ibid*, p. 382.)

89. Most of the estates under the Court of Wards can have demonstration farms and seed farms for the growth and distribution of pure seed to the ryots. There might also be arrangements on the Estate farms for the breeding of cattle wherever facilities exist. In fact the working of home-farm lands attached to each estate would be an object-lesson for the ryots to learn improved methods. (*Ibid*, Pp. 382 & 383.)

90. With a view to bring home to the ryots in every district by actual demonstration the work of the experimental farms, our country should be provided with a number of trained men to go on lecturing tours, they being provided with the necessary equipment, as is done in Java. (*Ibid*, p. 383.)

91. It appears that in the Bombay Presidency there is the method of sending a gang of sugar boilers to different parts to show better methods for preparing *gur* from sugar-cane. A similar course should be adopted in the Madras Presidency for this and other purposes. (*Ibid*, p. 383.)

92. In all *experimental* stations, a separate *demonstration* farm should be maintained and worked on economic principles, its receipts and charges being kept distinct. (*Ibid*, p. 383.)

93. A monthly journal in the vernaculars should be edited under the guidance of the Department, in addition to any journals edited by private agency. (*Ibid*, p. 384.)

94. The number of seed-farms for cotton ground-nut, sugar-cane, etc., which have been started in certain Agricultural stations,

should be greatly multiplied for supplying the ryots with pure seed. (*Ibid*, p. 385.)

H. Other Industries.

95. The number of cotton mills should be increased and the quality of the yarn and cloth produced in them improved. (*Devan Bahadur P. Rajarathnam Mudaliar*, p. 11.)

96. Efforts should be made to popularise the use of improved handlooms; and weavers' guilds should be formed. (*Ibid*, p. 13.)

97. The aid of richer countries possessing spare capital will have to be sought for establishing an adequate number of cotton mills. (*Rao Bahadur R. N. Mudholkar*, p. 33.)

98. Action should be taken by our people which would, if not put a stop to, at least minimise the exploitation by outsiders of India's mineral wealth. (*Ibid*, p. 40.)

99. Government should give preference to Indian applicants (including resident Anglo-Indians) over foreigners in the grant both of prospecting licenses and mining leases. (*Ibid*, p. 40.)

100. Government should lay down a condition that in the case of a projected foreign (mining) company half its shares shall be placed on the Indian market, and that Indian share-holders shall have a proportionate representation on the managing board. (*Ibid*, p. 40.)

101. Larger areas for sugar-cane cultivation, growth of superior varieties, the cultivation of best root, greater utilisation of date palm juice, the establishment of factories and refineries carrying on operations with up-to-date appliances, will alone ensure the revival of the sugar industry. (*Ibid*, p. 42.)

102. The Excise Laws should be modified so as to permit the manufacture without license of rum or other forms of alcohol. (*Ibid*, p. 42.)

103. The number of oil-mills in the country should be increased in order, among other things, to save to the country cattle food and manure which are lost by the exportation of seeds. (*Ibid*, p. 43, and *Mr. M. R. Ramakrishna Aiyar*, Pp. 341-2.)

104. For effecting repairs in oil-mills a number of neighbouring mill-owners might combine to engage a flying mechanic. (*Mr. P. Ray Chaudhuri*, p. 209)

105. The site selected for oil-mills should be within easy reach of a railway station, or of a river navigable throughout the year. (*Ibid.*, p. 209.)

106. In the case of oil-mills a liberal margin of extra power should be allowed in calculating the capacity of the boiler and engine, when machinery is ordered for the Mill. (*Rao Bahadur D. V. Bhagavat*, p. 256.)

107. No new oil-mill should be built without previously taking the advice of experts or men of experience as to provision of room and arrangement of the buildings. (*Ibid.*, p. 256.)

108. Care must be taken that an oil-mill is built in a place where seed can always be had in plenty. (*Ibid.*, p. 256.)

109. Action requires to be taken to increase the efficiency of the tanning and dressing occupations and of the manufacture of leather articles. (*Rao Bahadur R. N. Mudholkar*, p. 44.)

110. Sugar refining, oil pressing, iron mining, paper making, wool and silk manufacturing, glass, leather, umbrellas, metal manufactures, stationery, carriages, call for the application of capital and enterprise by Indians. (*Mr. V. G. Kale*, p. 73.)

111. They in Madras should devote themselves to the introduction of suction gas producer plants and the improvement of the methods by which the wood in their forests and plantations may be converted into charcoal and the various bye-products for some of which there is a considerable demand. (*Mr. Alfred Chatterton*, p. 177.)

112. The combination of a wood distillation plant with a central power station should prove a very remunerative undertaking if worked on proper lines. (*Ibid.*, p. 199.)

113. The charcoal manufacturing plant should be of a modern type fitted with all the apparatus necessary to obtain the valuable bye-products of which the most important are acetate of lime, methyl, alcohol and tar. (*Ibid.*, p. 199.)

114. The Government of Bengal may attempt a demonstration of the feasibility of small Dye-works by itself starting such a small factory. (*Professor E. R. Watson*, p. 245.)

115. For the plain dyeing of yarn and piece-goods, a start at any rate, could be made in quite a small factory consisting of a simple godown for dyeing-house, an engine-house, a dyeing-shed and a compound. It would probably pay best in such a small factory not to attempt too many classes of work. (*Ibid*, Pp 249 and 51.)

116. The Government of Bengal should allow the officers in charge of the dye-houses in their large jails to prepare memoranda, showing the amounts of dye-stuffs and chemicals, fuel and labour required in dyeing a given weight of yarn or cloth by the various processes used in the dye-house under their charge. (*Ibid*, p. 253.)

117. It behoves India to treat the arts craftsman with more than ordinary sympathy and to support this interesting and deserving community by developing in every way within her power the special trades to which these people devote their hereditary knowledge and extraordinary manipulative ability. (*Mr. Percy Brown*, p. 261.)

118. Steps should be taken to revive the trade in the white and indigo cotton rug of Multan and also purge out the present gruesome style of manufacture. (*Ibid*, p. 264.)

I. Miscellaneous.

119. Standardisation and unification of weights and measures should be secured. (*Rao Bahadur R. N. Mudholkar*, p. 52.)

120. There should be for each province a Director of Industries like the one appointed by the Government of Madras and there should be associated with him a small committee of eight to 12 (half of whom at least should be Indian non-officials connected with industries or commerce), who should serve as a standing committee of reference to all who want information. (*Ibid*, p. 54.)

121. The trials for testing the commercial success of a new undertaking should be conducted under this officer and the committee associated with him. (*Ibid*, p. 54.)

122. Industrial and Agricultural Exhibitions should be regularly held along with the National Congress. (*Ibid*, p. 54.) Each province or district should have a quinquennial Exhibition,

which must be run on the Kindergarten system so as to be really educative. (*Mr. D. E. Wacha*, Pp. 391-2.)

123. Men who have received modern education should turn their attention to the Indian system of accounts and come forward to act as accountants and managers in Indian firms. Thereby they would vastly increase their opportunities of good and useful employment. (*Rai Bahadur Lala Baij Nath*, Pp. 146 and 55.)

124. *Sattas* (wagering contracts) should be made punishable by law. (*Ibid*, p. 156.)

125. If the Government's efforts to raise Indian art are to bear fruit, the workman should first be freed from the bondage to the middleman and the merchant. (*Mr. A. Tellery*, p. 168)

126. Some Government Department in Calcutta, say, the Commercial Intelligence Department, or the Economic Section of the Indian Museum, can be of considerable help to would-be manufacturers, if it got together a collection representing the chief classes of goods which find a market in this country, together with detailed information as to the demand which exists for each class of goods and the prices at which they sell. (*Professor E. R. Watson*, p. 251.)

127. Co-operative Societies should be organised in different centres and villages somewhat on the lines of the Danish Co-operative system, which is a 'combination of a number of proprietors for sending their products to a central factory in which each of them has a share proportioned to the quantity of his contributions. (*Dr. M. C. Nunjunda Rao*, p. 276.)

128. In the formation of Joint Stock Companies care must be taken that business principles are strictly enforced and that the directors are men of responsibility, capacity and experience. (*The Honourable Sir Vithaldas Thackersey*, Pp. 430-2.)



Resolutions passed at the Fourth Indian Industrial Conference held at Madras on the 26th and the 27th December 1908.

I.—DEPARTMENTS OF INDUSTRY.

Resolved—

(a) That this Conference is of opinion that there should be in every province of British India a Department of Industry under a Director of Industries to deal with industrial questions and to be in charge of technical and commercial education as well as industrial instruction; and that there should be an Advisory Board of qualified persons, not less than one-half of whom should be non-official Indians who should be consulted on all matters of importance;

(b) That the functions of this Department should include (1) the supply of advice in regard to new industries, (2) the introduction of new or improved methods and processes, (3) the carrying out of investigations and experiments, (4) the development of selected industries, and (5) the organization of industrial and commercial exhibitions;

(c) That there should be an industrial museum and a bureau of information under the Department of Industry for supply of information to the public on industrial and commercial matters.

[Proposed by D. E. Wacha, Esq. (Bombay), seconded by Rao Bahadur G. Srinivasa Rao (Madura), supported by R. V. Mahajani, Esq. (Akola), and carried unanimously.]

II—TECHNICAL AND INDUSTRIAL EDUCATION.

*Resolved—*That this Conference re-affirms the Resolutions of the previous Conferences on Technical and Industrial Education, and urges (1) that the Victoria Jubilee Technical Institute, Bombay, and the College of Science, Poona, be enlarged so that they may between them supply for the Presidency of Bombay technological instruction in all the branches of mechanical and

chemical industries ; (2) that the Government of India may sanction the proposal of the Government of Bengal to add classes in Industrial Chemistry to the Sibpur Engineering College ; (3) that the Government of Madras will be pleased to give effect to the recommendation of the Ootacamund Industrial Conference that the Madras College of Engineering should be expanded into an Institute of Technology ; (4) that the Secretary of State might accord early sanction to the proposal of the Government of the United Provinces that a College of Technology should be opened at Cawnpore ; and (5) that similar institutions should be established in the Punjab, Burma and Eastern Bengal and Assam.

[Proposed by the Honourable Pandit Madan Mohan Malaviya (Allahabad), seconded by the Honourable Mr Gokuldas K Parekh (Bombay), supported by T. Rangachariar, Esq. (Madras and Lala Dharam Das Suri (Lahore), and carried unanimously.]

III.—COMMERCIAL EDUCATION.

Resolved—

(a) That in the opinion of this Conference the time has come for the Indian Universities to create Faculties of Commerce and institute Degrees in Commerce, and to affiliate Commercial Colleges that will prepare candidates for University Degrees in Commerce ;

(b) That there should be established one College of Commerce at each provincial capital and that it should include provision for the training of teachers for Commercial Schools in the mofussil.

[Proposed by K. Subramani Aiyar, Esq (Bombay), seconded by D. G. Dalvi, Esq (Bombay), and carried unanimously.]

IV.—AGRICULTURAL BANKS.

*Resolved—*That this Conference again invites the attention of the Supreme and the Provincial Governments to the urgent need for Agricultural Banks both to assist co-operative credit societies and, in cases where co-operative credit societies cannot or will not serve, to advance loans directly to agriculturists on easy terms, and urges them to take early action in the desired direction in conjunction with Indian capitalists who, the Confer-

ence feels confident, would be ready to co-operate with Government in any such scheme.

[Proposed by Lalubhai Samaldas, Esq. (Bombay), seconded by Rao Bahadur Khandubhai G. Desai (Surat), and supported by Rao Bahadur V. K. Ramanujachariar (Kumbakonam), and carried unanimously.]

V.—COTTON EXCISE DUTY.

Resolved—That this Conference records its emphatic protest against the continuance of the excise duty on Indian mill-made cloth as an unjust and unnecessary impost and urges that it should be removed without delay.

[Proposed by Uttamlal K. Trivedi, Esq. (Bombay), seconded by Pandit Rambhuj Dutt Chowdhuri (Lahore), and carried unanimously.]

VI.—RAILWAY RATES ON GOODS.

Resolved—That this Conference calls the attention of the Government to the prevailing complaints about existing railway rates, and suggests that an enquiry should be instituted into their effect on indigenous industries, especially in their competition with imported goods, and further submits that the rates should be reduced where their effect may be proved to be injurious.

[Proposed by Dewan Bahadur Ambalal S. Desai (Ahmedabad), seconded by Rao Bahadur Deorao Vinayak (Akola), and carried unanimously.]

VII.—MINING, WEAVING AND SUGAR INDUSTRIES.

Resolved—That while expressing its satisfaction at the steady progress of the Swadeshi movement, this Conference, concurring with the last Conference, calls the particular attention of capitalists and the general public to the necessity of developing the Mining, Weaving and Sugar industries, and urges the formation of Joint Stock Companies for working mines and erecting mills and factories.

[Proposed by the Honourable Sir Vithaldas D. Thackersey, *Kt.* (Bombay), seconded by G. Subramania Iyer, Esq. (Madras), supported by the Honourable Mr. H. S. Dikshit (Bombay), and carried unanimously.]

VIII.—OFFICE-BEARERS AND FUNDS FOR NEXT YEAR.

Resolved—That this Conference re-appoints Rao Bahadur R. N. Mudholkar as General Secretary and Mr. C. Y. Chintamani

as Assistant Secretary for the year 1909, and appeals to the public for a sum of Rs. 5,000 to meet the expenses for the next twelve months.

[Proposed by N. Subbarao Pantulu, Esq. (Rajahmundry), seconded by Babu Ganga Prasad Varma (Lucknow), and carried unanimously]

MADRAS, }
The 27th December 1908. }

R. N. MUDHOLKAR,
President,
The Fourth Indian Industrial Conference.

THE FOURTH INDIAN INDUSTRIAL CONFERENCE.

FIRST DAY'S PROCEEDINGS.

The Fourth Indian Industrial Conference was held in the Congress pavilion at Madras on Saturday, the 26th and Sunday, the 27th December 1908. There was a distinguished assemblage, and the proceedings were opened at 12 noon by Dewan Bahadur P. Rajarathnam Mudaliar, C.I.E., Chairman of the Committee, who delivered the following speech in welcoming the delegates.

SPEECH OF THE CHAIRMAN OF THE COMMITTEE

BROTHER-DELEGATES AND FRIENDS,

On behalf of the Reception Committee, I have very great pleasure in according you a most cordial welcome to this Conference. The pleasure is greatly enhanced by the feeling that on this platform we shall all meet without any difference of creed or convention, but as brothers and members of one united family, actuated by one common object, *viz.*, the industrial regeneration of our motherland. To whatever caste or sect, to whatever profession or calling we might belong, we meet at this Conference with the sole object of devising the best means of developing our vast industrial resources and thus promoting the moral and material prosperity of 300 millions of our fellow-countrymen.

Gentlemen, the object is a noble one, and demands noble sacrifices,—great and continued sacrifices of time, labour and money—from every true Indian who has the welfare of his country at heart, be he a Hindu, Mahomedan, or Christian.

It is now three years since the Industrial Conference was organized as an adjunct of the Industrial Exhibitions that have been annually held under the auspices of the Indian National

Congress since 1901; and no one can deny that during this short period, much good and useful work has been done in furthering the cause of Indian industrialism. One has merely to glance through the reports issued by our indefatigable General Secretary, Rao Bahadur R. N. Mudholkar, the President-elect of the Fourth Industrial Conference, to form some idea of the extraordinary amount of industrial activity that has been displayed in every province of this great Empire. At the same time, it must be confessed that what has been done so far is but a drop in the ocean compared with what remains to be accomplished before India can be ranked amongst the industrial nations of the world. When that millennium might be reached it is difficult to foretell, but, gentlemen, if we are true to ourselves, true to our country, and true to the Government under which Providence has placed us, the time cannot be far distant. Within the past few years, there has been a great industrial awakening throughout the length and breadth of this vast continent and a genuine *Svadeshi* spirit has sprung up amongst the people. That spirit, if properly controlled and guided, is bound to produce far-reaching results. The ground has been cleared and is ready for sowing, thanks to the wise counsels of the distinguished gentlemen who had guided the deliberations of previous Conferences and to the untiring labours of our General Secretary and his assistant Mr. C. Y. Chintamani. What we now want is a band of earnest, enthusiastic, honest workers in every district and in every industrial centre, who will sow the seed, tend its growth and bring it to maturity.

Gentlemen, the Conference has the good fortune of meeting this year under peculiarly favourable circumstances. The question of technical education and industrial development which has been under consideration for several years, has now been seriously taken up by the Imperial Government and under its directions, some of the Local Governments have submitted, while others will soon submit, definite proposals for carrying out a comprehensive scheme under which there is every prospect of a fully equipped Technological College and Research Institute being established in the different provinces, before the next session of the Conference, if not earlier. It seems to me unnecessary at this stage to go into the details of the several schemes that have been put forward in this connection. They all aim at giving special facilities for

the development of our indigenous industries and as such they should be cordially welcomed as a first instalment towards the fulfilment of one of the prime duties of the State. Some of our countrymen might possibly be disposed to think that the schemes that have been published do not go far enough and will not fully meet the requirements of the case. It is true that owing to various causes, India has fallen far behind the other nations of the world in the race for industrial advancement and very great efforts are necessary on the part of the State to enable us to recover lost ground, but there can be no question that a great step has now been gained and we may rest assured that further State aid will be forthcoming as soon as we have proved our fitness to take full advantage of it. We may also confidently hope that His Excellency the Viceroy, and Lord Morley, the Secretary of State for India, who have just announced those splendid constitutional reforms which have evoked universal rejoicings from one end of the country to the other, would not hesitate to sanction with a liberal hand the still more urgent reforms that are necessary for India's industrial regeneration. At the lowest estimate, an initial outlay of about a crore of rupees would be required to establish a properly equipped Institute of Technology and Research in the various provinces and an annually recurring charge of about twenty-five to thirty lakhs of rupees to carry on the work of the Institute. Considering the great interests involved, you may be sure that His Excellency Lord Minto will not grudge to sanction this outlay, large as it may appear. The amount is a mere trifle compared with what is being spent in much smaller countries of Europe and in the various States of America.

Before leaving this subject, I think it necessary to make a few observations on the action taken by the Madras Government in dealing with the industrial problem as affecting the conditions in this Presidency. Two years ago a special officer of exceptional qualifications was appointed by the Government to conduct industrial and technical enquiries throughout the province. On receipt of his report H. E. Sir Arthur Lawley with his well-known sympathy and promptitude, at once decided to take the public into confidence and convened a Conference of representative gentlemen, officials and non-officials, including members of the Chamber of Commerce and Trades Association, to discuss this

difficult question in all its bearings. After a prolonged discussion extending over a week, the Conference submitted a comprehensive series of proposals (about sixty-eight in number) all of which with one exception have been approved by the Government and which when carried out will go far to meet the industrial requirements of this Presidency. The Government have already issued orders to give immediate effect to some of the more important recommendations which could be carried out without reference to higher authorities. These are (1) the appointment of a Director of Industries, (2) the formation of a bureau of industrial information and an industrial museum, (3) the preparation of a list of industries which are of sufficient importance to require the establishment of industrial schools in relation to them, (4) and the formation of local industrial committees. As regards the latter three proposals, the Director of Industries was authorised to take action at once, and he was further directed to submit proposals for giving effect to the recommendations of the Conference in regard to (5) the establishment of six weaving institutions at certain centres, each under the superintendence of an Indian expert of textile manufacture, (6) the employment of a dyeing expert to investigate the state of the industry throughout the Presidency, to carry out such of the suggestions as may be feasible, and to consider the question of establishing one or more trained dyers' schools on the lines of the Leeds and Bradford Colleges, (7) the development of the Government Chrome Tannery at Sembiam into a leather trade school in which efficient practical instruction could be given, (8) the offer of a reward for a suitable oil-extracting plant which could be advantageously used in improving the present methods of extracting oil, (9) the extension of well-boring operations with a view to utilize the vast stores of our under-ground water supply for purposes of irrigation, and (10) the constitution of a board of experts for investigating the condition of chemical industries in this country. Gentlemen, there can be no question that the action thus taken 'will form a substantial instalment of the scheme of industrial activity contemplated by the Conference' and will prove of incalculable benefit to the people of this Presidency who cannot but feel highly grateful to His Excellency in Council. We have also the further assurance that the other recommendations of

the Conference 'will be brought under review by the Director of Industries and considered by Government from time to time.'

On one point, however, some disappointment has been felt. The order of Government does not contain any definite pronouncement regarding the establishment of a Technological College and Institute. The Conference recommended that the Madras Engineering College should be expanded into an Institute of Technology with complete laboratory and workshop equipment for imparting education in engineering in all its branches and such other technical subjects as are suited to the needs of the country. It was considered that, without such a fully equipped college, industrial development cannot make much headway in this Presidency. But, gentlemen, H. E. Sir Arthur Lawley has always been known to be a most cautious statesman and he is doubtless anxious to feel his ground before launching upon this large scheme. I am sure that the Government of Madras have only delayed their expression of approval of the expansion of the Engineering College pending the sanction of higher authorities in view to the large expenditure that the scheme would involve. It may also be hoped that, pending the development of such a college, a number of workshops would be established, if not in every district, as suggested by the Conference, at least in certain centres where there are large workshops already in existence, either in connection with State or Guaranteed Railways, such as Perambore, Negapatam, &c., or in connection with the P. W. D., such as Dowlaishwaram, Bezwada and Madras. This would enable the Government without much expense to train skilled mechanics qualified to give manual training in the use of tools, &c, in industrial schools and to instruct village artisans 'in accuracy of work, in the use of special tools and in the repair or manufacture of simple machines,' and agricultural implements. There are also a few other directions in which I am sure His Excellency in Council will take definite action before the next official year begins.

Before proceeding further, I should like to say a few words on the question of 'protective tariffs' which is intimately connected with our industrial development. That question has been before the public for several years past and I think it must be pressed again and again. Every country in the world, England alone excepted, resorts to a system of tariffs and bounties to foster her

own industries. Even in free-trade England, a very large body of opinion in favour of protection, has been springing up and is steadily gaining ground. Situated as India is, without capital, without enterprise, without any scientific technical education and training, many of her industries which possess great possibilities of development have suffered and must continue to suffer from unfair competition from countries much more advanced, where free-trade principles are not recognised. Germany, for instance, not only resorts to prohibitory duties but also grants large bounties in certain cases to bolster up her own industries and floods the Indian markets with her own products, and is thus ruining our sugar and indigo industries. America imposes heavy prohibitory duties on the imports of dressed and tanned skins from India and Japan has even raised her tariffs against Indian indigo though she allows the imports of the synthetic indigo of Germany and the natural products of Java on more favourable conditions under the most favoured nation clause. It is, therefore, imperative that a certain amount of protective tariffs should be imposed to give a fair start to some of our industries, which cannot otherwise revive. Other nations have had a long start and it is difficult to compete on equal terms without some amount of protection. That has been the position even in more advanced countries in Europe. -

Gentlemen, whatever action may be finally taken by the Government of India in regard to the development of our industries, one thing is clear, and that is that we are now in a better position than before to determine what our sphere of action and line of policy should be in the future, and concentrate our energies in carrying out that policy to a successful issue.

In his memorable address delivered at the Calcutta Industrial Conference in 1906, H. H. the Maharajah Gaekwar, the enlightened ruler of Baroda, said: 'When hundreds of thousands can work in mills and factories, millions and tens of millions work in their own huts;' and he urged that 'any comprehensive plan of improving the condition of our industrial classes must seek to help the dwellers in cottages,' who 'form the main portion of the industrial population and who deserve our sympathy and help.' By all means 'help and encourage' he said, 'the larger industries, but foster and help also the humbler industries in which tens

of millions of village artisans are engaged and the people of India, as well as those who are engaged in the work of administration, will bless your work.' Gentlemen, we cannot do better than follow this excellent advice. There are many directions in which private enterprise can do much good without Government initiative and without expensive machinery. Take, for instance, our textile industry, which, next to agriculture, is the most important industry in the country. Next to America, India is the largest cotton-producing country in the world ; yet what is the position ? We annually *export* raw cotton to the extent of Rs. 25·70 crores worth and *import* yarn and piece-goods to the value of Rs. 48 crores.

Consider for a moment and try to realise what a wide field exists here for private enterprise to develop this one branch of our industry, both by the establishment of additional mills and by the introduction of improved hand-loom. Our enterprising brethren of the Bombay Presidency have, in this as in many other matters, taken the lead in establishing a number of cotton mills which now supply yarn and cloth for home consumption to the extent of 30 p.c. of our requirements, besides exporting a large quantity of twist and yarn to China and Japan. This latter trade is, however, in danger of being seriously affected as China, the chief consumer of our mill products, has begun to develop her immense industrial resources and Japan is also becoming a formidable rival of India by protecting her industries by a system of bounties and thus giving her cotton goods, especially hosiery, an advantage over goods made in India. In consequence of this unfair competition, the large hosiery department of the Bomanji Petit Mills of Bombay has had to be closed.

We should therefore gird up our loins and put forth greater efforts to increase the number of our mills and improve the quality of the yarn and cloth produced in them. During the past five years, the number of these mills has increased from 206 with 45,280 looms and 5·16 million spindles to 224 mills with 65,741 looms and 5·76 million spindles and the output of yarn and woven goods from 578·75 and 138·04 million lbs. to 638·30 and 189·05 million lbs., respectively. An immense stimulus would be given to this enterprise if the excise duty on India-made goods were abolished, but there is apparently no near prospect of this long-sought-for boon being

granted. Most of the mills referred to above are to be found in the Bombay Presidency, but making every allowance for the great natural advantages that that fortunate Presidency enjoys, it does not speak much for our spirit of enterprise that this province cannot boast of more than 11 cotton mills, of which only 4 are to be found in the capital city. Of these again, only one is owned by Indians and that by an enterprising Bhatia from Bombay! It is my fervent hope that before this Conference disperses, a strong effort will be made by the leading gentlemen of this place—members of the mercantile community and of the learned professions—to form a limited joint stock company and establish a mill of their own. Such a mill in the city is all the more necessary to afford facilities for mechanical engineering students to obtain practical training in workshops which at present is not easily obtainable. It is a sign of the times that the Nattukottai Chetties of this Presidency, who are the great bankers of Southern India, but who have hitherto confined their activities chiefly to money-lending and temple-building, have now turned their attention to the establishment of some mills and factories. Under proper guidance, they might do more for our industrial development, as they possess a power of organization which is unknown in any other community in this Presidency.

Passing now from the Mill industry to the Hand-loom industry, there is here a yet wider field for developing our Textile manufactures. Experiments conducted under expert supervision, both in Government and private weaving factories in various provinces, more especially in Madras by Mr. A. Chatterton and the Hon'ble Mr. P. Theagaroya Chettiar, have established beyond doubt the superiority of the fly-shuttle looms over the ordinary country looms. The 'All India Weaving Competition' which was held in this city some ten months ago under the auspices of the National Fund and Industrial Association, has also established the fact that, except in the manufacture of solid-bordered cloths, the improved loom is capable of turning out double the quantity of cloth—even of higher counts up to 150's—that could be woven on the ordinary looms, and what is of special importance, the improvement could be effected at a cost of less than rupees ten, by simply attaching the fly-shuttle arrangement (the slay) to the ordinary pit-looms to be found in the home of every weaver's

family. Here then is a direction in which, without any large outlay and without much technical training, private organisations can do immense good to millions and tens of millions of the artisan classes by introducing the improved fly-shuttle looms into every weaving centre and into every weaver's home, and by encouraging the formation of weavers' guilds throughout the country. All that is required is practical demonstrations to bring home to the weaver the undoubted advantages of the improved loom. With a view to carry out this object, the National Fund and Industrial Association sent out in August last three weaving instructors, with the necessary complement of weaver maistries and fly-shuttle slay, &c., to three selected districts, to demonstrate the advantage of the fly-shuttle loom by attaching the slay to the country loom and weaving the same description of cloths that the local weavers usually turned out. Two of the instructors have not yet done any useful work, owing to want of local co-operation and help, but in the case of the third individual who was deputed to some weaving centres near Kumbakonam, in the Tanjore District, the Association was fortunate enough to secure the cordial sympathy of our venerable friend Dewan Bahadur R. Ragoonath Rao, and the active co-operation and help of Rao Bahadur V. K. Ramanuja Chariar, a retired Secretary of the Revenue Board, and another local gentleman, and the result has been on the whole very satisfactory. More than fifty improved looms have been brought into use so far in these three villages, including four which are being worked by Brahmans, and applications are being received for more.

Gentlemen, the report which Mr. Ramanuja Chariar has sent of the work done so far in the Tanjore district is interesting and instructive and will be found in the appendix. In a previous letter written on the 19th October last, Mr. Ramanuja Chariar wrote: 'So far as I have seen, the weavers are taking an interest in the matter and are asking for the fly-shuttle. The Brahmin class is also coming in. I saw a Sastri at Tiruvadamardur (a sacred place and a good weaving centre) who, preferring living by his own hand to begging, has set up his own loom with the fly-shuttle, and is working handkerchiefs.' My friend adds, in his usual terse style, 'This is a hopeful sign.' Brother-delegates, it is indeed a most hopeful sign and is very significant of

the industrial awakening that is springing up even in this remote province. It behoves us to see that this new spirit is not allowed to evaporate, but is kept alive and is directed into useful channels.

Gentlemen, what is being done by my friend Mr. Ramanuja Chariar in one taluk ought to be possible in every weaving centre, not only in this Presidency, but throughout India. I am aware that action in this direction has already been taken in other provinces. But until we succeed in securing some thousands of earnest and disinterested workers in every province, no great results could be achieved. I for one cannot bring myself to believe that the formation of such a small band of earnest workers in the cause of India's industrial salvation would be difficult of accomplishment, if the men are properly approached; and I trust that the Conference, before it disperses, will make it its duty to insist upon every delegate binding himself to be responsible for securing a certain number of zealous workers for the country's good. It is only then that we can hope to effect any real advancement of our industries. Here is what our good friend Dewan Bahadur Raghoonath Rao says in an article contributed by him to the newspapers of the 11th November last under the heading of 'Advice to our Leaders': 'We want men of character, intelligence, wealth, reputation, experience, unflinching loyalty, real fear of God, and fixed determination to love our brethren and make their sorrows and happiness their own.'

Let one and all of us lay this excellent advice to heart, unite our scattered forces under the banner of this veteran leader and other equally zealous captains, and work for the salvation of our country. (*Loud Cheers.*)

APPENDIX.

[Mr. V. K. Ramanujachariar's Report referred to at p. 13.]

I completed the inspection of Weaving Inspector Sundara Iyer's work at Kumbakonam, Tiruvadamardur, and Tirunageswaram a week ago.

2. At Kumbakonam Sundara Iyer has supplied 5 fly-shuttle looms to a company recently formed near the Post Office under the designation of 'The Reliance Company.' The weavers of this company have been well trained and are turning out good work, so much so that they are unwilling to let any one go into their factory and learn how they manage their

looms. They are also making more looms of their own on the pattern of Sundara Iyer's loom. Owing to difficulty in getting steady and honest men of the weaver's caste, the company employs men of other castes.

3. A loom has been supplied to a member of the weaver's caste, who finds it very useful. He has applied for a second loom, which is yet to be supplied.

4. An association of Shanars and Muhammadans has begun to work near the Railway station and its members have learnt to handle the looms with the aid of a loom supplied to them by Sundara Iyer. A Mysore Engineer, who is now on leave and who is likely to retire at the end of it and settle here, has provided accommodation for 14 looms in the south-west of the town, and an Iyengar, who owns premises to the south of Chakrapani Swami temple, is proposing to work 8 looms. This gives a total of 28 looms. Six looms have been supplied so far, and others are in active preparation. The workmen are also being trained under one of the maistrs with frequent visits by Sundara Iyer.

5. At Tiruvadamardur 14 fly-shuttle looms are at work. Two of these are owned and worked by Brahmans of the Smartha sect. One of these is the person referred to in my letter to Dewan Bahadur Rajarathna Mudaliar, an extract from which was published in the *Hindu* some time ago. The other loom is worked by two Brahmans alternately. When I inspected their place of business, I found their females at work in the weaving line. They have asked for an additional loom, so that each may have a loom for himself. Two Provident Funds managed by Brahmans have 5 and 3 looms respectively. On the date of my inspection the five looms were lying idle, the weavers having absconded. The manager is on the look-out for young boys who will be trained by Sundara Iyer. The other company was to start business on the 10th instant. At Sundara Iyer's residence 5 looms were at work, two of which were owned and worked by Brahmans.

These 6 men were learning work. One of the looms has since been given to the Rance's Lower Secondary School of the same place, where a weaving class has been formed. In my next report I shall note the progress which the school is making.

6. At Tirunageswaram 9 looms were supplied to members of the weaving caste and the workmen do not require any more help from Sundara Iyer. Other weavers of the place and its immediate neighbourhood have made 9 looms of their own, similar to Sundara Iyer's, and they have also without his help learned to handle them fairly well. I have asked Sundara Iyer to see these looms and rectify any error which he may discover. He has so far carried out my instructions with regard to 4 looms.

7. I went to Mayavaram on 9-12-08 on other business when I received a deputation of 15 boys who have most of them appeared for the Matriculation examination. They are full of zeal for the Swadeshi cause

and do not wish to enter service. I impressed upon them the importance of being loyal. They are going to bind themselves to work together for a certain period under the direction of the Gymnastic Instructor of the Municipal High School. They will pay all their expenses and I have instructed Sundara Iyer to send his best maistry to train them. I expect great results from these young men, provided that their enthusiasm does not evaporate after some time. But I believe this is not likely.

8. Sundara Iyer has supplied 9 looms to the villages of Govindapuram, Tuhili, Tiruppanipettai and Chidambaram. All but the last are within some distance of Tiruvadamarudur. These looms I have not been able to inspect.

9. I found that Sundara Iyer has effected some improvements. One is an arrangement for rolling up the free end of the warp by means of a roller so as to save space, and the other is a double loom to be worked by a single person.

10. Numerous applications are being received for the fly-shuttle looms, especially from the Brahman community. I have steadily set my face against Sundara Iyer's going about to distant places before the requirements of Kumbakonam, Tiruvadamarudur and Tirunageswaram are fully met. The loom is being appreciated and the Brahmans are beginning to think that manual labour at the loom is not beneath their dignity. These are hopeful signs, but much patience is required before the result can be regarded as fully assured. The labour of inspection, instead of being irksome, is very pleasant to me and will be amply rewarded if I can in some measure contribute to the advancement of the weaving industry.'

At this stage their Excellencies Sir Arthur and Lady Lawley arrived at the pavilion accompanied by A. Y. G. Campbell, Esq., Private Secretary to His Excellency, and Captain the Hon. Mr. Vesey, Aid-de-Camp. They were received at the entrance by the Secretaries and other leading members of the Committee and led to their seats on the *dais*.

ELECTION OF THE PRESIDENT.

The Honourable the RAJAH OF KOLLENGODE (Madras) next proposed that Rao Bahadur R. N. Mudholkar be elected President of the Conference in the following terms :—

GENTLEMEN,—It is very gratifying to me that the pleasant duty of proposing the election of Mr. R. N. Mudholkar to the Presidentship of this Conference has fallen to me. Mr. Mudholkar is so well known to us in Madras by reputation, on account of his long and strenuous work for the industrial advancement of

our country, that very little is required of me to be said in favour of my proposal. I need hardly say how pleased we all of us in Madras are that the Conference meets here this year. Gentlemen, it is particularly appropriate that it should be so. Only last September the Government of Madras convened a Conference at Ootacamund to discuss several most important industrial questions, and the very instructive speech delivered on that occasion by His Excellency the Governor is fresh in the minds of all of us. Their Excellencies' presence to-day at this Conference in the midst of their multifarious duties and engagements is yet another proof of the deep interest taken by the Madras Government in the industrial development of this Province. It has to be recognised that, without the hearty co-operation and help of the people, the Government alone cannot do much in this matter. The proceedings of this Conference will, I hope, with God's blessing, be of some use both to Government as well as to the people in the difficult, but none the less necessary task of working out the industrial regeneration of our country.

Mr. Mudholkar's sound learning and wide experience will, I have no doubt, be a great advantage to us in guiding us in our deliberations and I have great pleasure in moving that he be elected President of this Conference.' (*Cheers.*)

SIR BHALCHANDRA KRISHNA, A7. (Bombay) seconded the proposition. In doing so he said : Your Excellencies, Ladies and Gentlemen,—I feel great pleasure in seconding the proposition which has been placed before you by the Rajah Sahib. I believe you are aware that the idea of an Industrial Conference originated from that marvellous brain, I mean the late Mr. Justice Ranade, who held a few Industrial Conferences in the Deccan, but for some reason or other the idea was not carried out for some time. It was in 1905 that our friend Rao Bahadur R. N. Mudholkar and his able and energetic coadjutor Mr. C. Y. Chintamani conceived the idea that to our annual gatherings of the Congress and Conferences the Industrial Conference would form a fitting auxiliary, and it was due to the untiring energy of these gentlemen that the Conference was first brought into existence in its present form in 1905 at the Benares Congress, and our esteemed friend Mr. R. C. Dutt presided at it. The second Conference took place in Calcutta, at which my distinguished friend Sir Vithaldas Damodher

Thackersey presided. Then we had the pleasure of hearing a most interesting address from His Highness the Gaekwar of Baroda. The third Conference was held under the presidency of my esteemed friend Dewan Bahadur Ambhalal Sakerlal Desai and to-day we have met under the auspices and the ægis of the Madras Government as shown by the distinguished presence of His Excellency the Governor of Madras. We are, therefore, met under such excellent auspices and we wish every success to this Conference. Mr. R. N. Mudholkar has been taking the greatest interest in this industrial movement. In spite of his extensive professional practice and in spite of his having taken the greatest interest in the Congress movement of which he is the Provincial Secretary for Berar, he has taken very great interest in this industrial movement. But let me tell you it is not a lip interest that he has taken. He has taken a real living interest in this industrial movement by having started in 1881 in Berar a trading company and after that he has been instrumental in establishing a mill at Amraoti and an oil mill at Akola and several other industrial concerns in Berar; and it is therefore fitting, I think, that we have a gentleman of his type to preside over the deliberations of this Conference. He has been the General Secretary of the Conference since its birth in 1905 and a gentleman who has taken such great interest and pains in spreading the idea of an Industrial Conference should be the President on this occasion. I say this because I feel that Rao Bahadur R. N. Mudholkar will do justice to his position as President of this Conference and he will also be able to give a very strong impetus to the movement. I say this is really a Swadeshi movement. The Industrial Conference in India is really a Swadeshi movement. All tall talk is perfectly useless in this matter, because the regeneration of India depends on the development of the industries of India, and it is therefore I have the greatest pleasure in seconding the proposition. Gentlemen, I am sure you will all carry it with acclamation. (*Cheers.*)

The proposition having been carried by acclamation, Rao Bahadur R. N. Mudholkar took the chair amid loud cheers and delivered the following address.

industrial and economic problem in the intricacy of its nature and the far-reaching importance of its results. Our well-being in the immediate present and our progress in the future are as much dependent upon the establishment of a healthy condition of industrial activity as upon political advancement or social reform, and the same self-sacrifice and devotion to duty are required from our public men by the first as by the other two. Indeed most of the political and social questions which confront us and make urgent demands upon our close application are at their base economic. It is only by a full recognition of the intimate connection and inter-dependence of these three spheres of activity, that it is possible to ensure a healthy existence for the nation. Non-political though the Industrial Conference is in its character, the matters with which it has to deal cannot be dissociated from administrative policy and measures or the intellectual and moral condition of the people. It is only by a well-regulated treatment of all the three classes of questions that progress can be achieved.

THE INFLUENCE OF IDEALS.

Gentlemen, the advance or stagnation of a nation depends upon its outlook upon life, its ideals, its moral and spiritual fervour, its practical spirit. The ascetic ideal, which holds in contempt this world and its interests, has exercised for centuries past a dominating influence on the Indian mind. It had not, it is true, sufficient reality and strength in it to permanently wean men away from the world, and it proved of little efficacy in diminishing selfishness and pettiness. But it nevertheless produced a baneful result. It took zest out of life. The fashion which it created of talking disparagingly of mundane affairs, operated in no small degree in bringing about our political degeneration and industrial decay. Money and wealth being objects of incessant attack and ridicule, few high-souled persons or men of genius cared to devote their thought or energy to the consideration of the material interests of the country and the



justice, not on dislike or hatred. It aims at rescuing millions of the people of this country from the poverty, destitution and moral degradation into which they have fallen through stress of circumstances. It seeks to place this country on a level with the most advanced. Its methods are help and co-operation. It relies on science, skill and energy. It is in fact an application to the industrial problems of this country of the ideal comprised in the doctrine of nationality. It is not combative and aggressive, but merely demands from the people support and protection for the nascent industries of this country, in the keen competition they have to meet from the established ones of foreign lands. This is a legitimate preference, and its propriety is conceded by all fair-minded persons.

But gentlemen, like all great ideas Swadeshism is in danger of being brought into difficulties and discredit by unwise excrescences and unjustifiable methods. Peace, order and absence of all kinds of turbulence are prime conditions for the exercise of the beneficent influences of trade, industry and art, and no action or propaganda which would endanger these ought to be tolerated by those who desire their progress. Great ends can only be achieved by a process of gradual development, often slow and always beset with difficulties. No short cuts are possible or should be attempted. We must not lose sight of the fact that self-denying ordinances can have only a limited scope and a short life. They can only afford encouragement to efforts. The eventual success of these efforts depends upon their inherent suitability. The motive power which will lead our nation to industrial eminence must come from the pursuit of science, the acquisition of practical skill and the organisation of capital. Armed with these and wielding them firmly and wisely, we can achieve success. Failures and disappointments there will be in the beginning. But these ought not to discourage us or lead us into impracticable paths. A nation which at one time occupied a great industrial position, should not lose heart because existing conditions

demand more strenuous application and more efficient knowledge and combination than was wanted in former times. The land is there, the climate is there, the raw materials which can be grown or found on the surface of the earth or taken out from its interior are there, the thrifty, sober, peaceful, industrial character of the population is still unimpaired and the keenness of intellect which created a great civilization is still intact. The newly awakened fervour should be directed to utilize these.

OUR INDUSTRIAL SITUATION.

Gentlemen, the present industrial situation is this. From a manufacturing nation we have become a mainly agricultural one. A country which supplied the most delicate and costly fabrics to the world, which prepared tools, implements, machines and arms of all descriptions, which manufactured every kind of metal ware and produced art ware of the most finished fashion, has become now a producer of food stuffs and raw material. For the clothes we wear, the pots and pans in which we cook our food or from which we eat it, the lamps which light our houses and streets, the very iron from which the implements of our husbandry are made, we have to depend mostly on foreign countries. The average income per head of the population of the country, whose far-famed wealth attracted crowds of foreigners to its shores, is according to the most optimistic calculation, only £2 as against £41 in England, 43·4 in Australia, 16 in Ireland, 9·9 in Russia. With the bulk of the population dependent on land the failure of a single monsoon spells ruin to millions of people. Sir William Hunter estimated that forty millions go through life on insufficient food. Sir Charles Elliott said in a settlement report: 'I do not hesitate to say that half of our agricultural population (*i.e.* over 70 millions at that time) never know from year's end to year's end what it is to have their hunger fully satisfied.' The periodical occurrence of famine is a source of constant dread to the Government and the people. Poverty in normal

years and absence of staying power is the chronic condition of the masses. The high prices of recent years have increased their hardships. This deplorable state of things is mainly due to their dependence upon one industry. The Famine Commission of 1879 say at Vol. II, p. 175 of their Report :—

‘ At the root of much of the poverty of the people of India and of the risks to which they are exposed in seasons of scarcity lies the unfortunate circumstance that agriculture forms almost the sole occupation of the mass of the population, and that no remedy for present evils can be complete, which does not include the introduction of a diversity of occupations through which the surplus population may be drawn from agricultural pursuits and led to earn the means of subsistence in manufactures or some such employments.’

The aim of the industrial movement is to supply all the necessities of life, and all the comforts and conveniences which cheer it from the materials which exist in abundance in the country. To be able to achieve this end it is necessary to have a fairly exact idea of the condition of the various existing industries, to ascertain how far they are capable of improvement and expansion, and to find out by a study of the economic history of other countries the methods to be adopted. It is not possible to go with any measure of fulness into these matters within the limits of an address like the present. Very brief indications only can be given and those also with regard to a few of the chief industries.

AGRICULTURE.

The first industry to claim our attention, gentlemen, is agriculture. Not only does it at present support the bulk of the population, but it must under any conceivable circumstances occupy a prominent position in the national economy. It is and will continue to be the source of our food supply and of the materials of some of our most paying manufactures. The total area of arable land available for cultivation in

British India (excluding Burma) is some 489,600 sq. miles. Out of this 358,400 sq. miles have been already brought under the plough. The area not brought under cultivation is only one-fourth of the total culturable area. But a very considerable portion of this nominally arable land consists of very inferior soil, the cultivation of which is not remunerative as things stand. Of recent years a much larger proportion than previously is sown for raising non-edible products like cotton, jute, &c., which, while unfit for food, are at the same time valuable articles of commerce and materials of manufactures. One of the factors which have brought about the present high prices of food stuffs is no doubt the contraction of the area under edible food grains. One of the problems which we have to solve is how to increase the quantity of food products from a contracted and probably yearly diminishing food-producing area. In the absence of scope for extension of cultivation we must look to intensive cultivation for the larger supplies of food stuffs that are required for consumption within the country, and for preserving the export trade we have secured, concurrently with meeting the home demand. A comparison of the present outturn per acre in this country with what was obtained here in former times and what is yielded by the land of other countries will show that there is a large field for improvement in this respect. Wheat land in the United Provinces which now gives only 840 lbs. an acre yielded 1,140 lbs. in the time of Akbar. The average yield of wheat per acre in India is 700 lbs.; in England it is 1,700. Of rice the yield in India is 800 lbs. as against 2,500 in Bavaria. The average yield per acre of cotton lint in this country is 60 to 70 lbs. In America it is 200 lbs. Despite the fact, to which such an authority as Dr. Voelcker bears testimony, that the better section of the Indian peasantry recognise as well as the peasants of Europe and America the value of manure, rotation of crops, the most suitable times for their growing, &c., it is undeniable that the wise canons of experience are in but too many cases not followed

in practice, and that owing to these and other causes the production from land is not what it should be, and what it can be. There is not a little slipshod cultivation which stands in need of improvement. Manuring is almost entirely neglected even by those who admit its value. Rotation itself is often disregarded. There is hardly any adoption worth the name of improved tools, implements and appliances. Along with the diminution in outturn there is also an alarming deterioration of quality due partly to want of care in the selection of seeds, partly to faulty husbandry and partly to the needs of the cultivator, who prefers an inferior hardy variety yielding a sure return to a superior one more liable to be affected by the inclemencies of the weather. Without venturing to lay down an universally applicable proposition, I would say this much with confidence, that experiments made by the Agricultural Department of the Government and by private individuals have demonstrated the feasibility of both increasing the quantity and improving the quality of our agricultural products by the adoption of methods which are not beyond the means or capacity of the ordinary cultivator, if more organised efforts on a larger scale are made by the educated leaders of the community and Government agencies, to spread more extensively than at present a knowledge of successful experiments, and if pecuniary facilities are supplied to landholders and cultivators. Travelling demonstrators should carry from village to village knowledge of the successful results achieved in the experimental and demonstration farms and actually show the operations to the villagers. The number of these farms themselves ought to be increased. The Agricultural Associations which have been established in several provinces should be more of a reality than they are, and branches of them should be established, if not in every important village, at least in every taluka or tahsil. The careful selection of seed, the adoption of superior varieties suitable to the locality and climate, the full use of the manure of farm and home cattle, the adoption of more

efficient cheap appliances, and the due observance of the principle of rotation of crops and of the cultivation of the leguminous plants, would impose no appreciable burden upon the cultivators. All that is required is the imparting of the knowledge of the latter day researches and working and a stirring up of energy. The loss of a vast quantity of most useful manure and food for cattle has resulted from the yearly growing exportation of cotton seed and oil seeds. The expansion of the oil industry, to which I shall presently refer, will prevent this loss considerably. The soil of India is deficient in phosphates. The bones of animals which can supply this deficiency are exported to the extent of 55 lakhs a year. If the establishment of chemical industries results in the supply of cheap sulphuric acid which can turn these bones into manure which is sufficiently cheap, a great benefit will be conferred upon the agricultural industry.

IRRIGATION.

The greatest difficulty which the ryot in India has to surmount is the deficiency of water. The rainfall is proverbially uncertain. Irrigation by canals is urgently needed and larger allotments than have been made till now ought to be made from the public funds. It is a regrettable fact that though the importance—the absolute necessity—of constructing more canals is admitted on all sides, sufficient action has not yet been taken to give effect to the recommendations of the Irrigation Commission. During all these years the capital outlay on irrigation comes to 46 crores of rupees as against 346 crores incurred on railways. And yet the outlay on irrigation yields after meeting working expenses, interest, &c., a net return of 4.6 per cent. per annum while the State railways give only 1.05 per cent.

LIFT IRRIGATION.

But there are tracts of the country in which canal irrigation does not exist or to which it cannot be extended. In these tracts it is the duty of Government, as ours also,

to establish cheap lift irrigation. The experiment of pump irrigation tried in the Madras Presidency has proved successful. It is quite feasible to largely extend the area under wet cultivation by constructing wells in the beds or on the banks of rivers and streams, and establishing steam, gas or electric installations for lifting water out of them and irrigating thereby millions of acres which at present depend only upon the spasmodic supply of rain water.

RYOT'S INDEBTEDNESS.

Another impediment to the progress of agriculture of a character as serious as the uncertainty or deficiency of water is the great poverty of the cultivators. The indebtedness of this class has increased to an extent to cause serious anxiety to the Government, and for over 30 years discussion has been going on as to what should be done to lift the ryot from his low condition. The expropriation of the cultivating classes by the capitalist and non-cultivating classes is not a healthy condition. The Famine Commission of 1901 estimated that in the Bombay Presidency at least one-fourth of the cultivators have lost possession of their lands, that less than a fifth are free from debt, and that the remainder are indebted to a greater or less extent. Various devices like the Deccan Agriculturists' Relief Act, the Punjab Land Alienation Act, etc., have been resorted to, but to little purpose. Mortgages and sales go on increasing year after year. Mere palliatives, mere symptomatic treatment will be of no avail. It is an exploded theory that the ryot is extravagant or improvident. No one who has seen the people in their houses and lived with them will say so. The ryot is obliged to borrow because he needs money for carrying on his field operations, for maintaining himself, his family and cattle, and for paying the Government or landlord's demand. His condition can be improved only (1) by real practical education, (2) by supply of easily obtainable capital at reasonable rates of interest, (3) by greater fixity of tenure and greater permanence in

the land revenue demand, and (4) by a more elastic land revenue collection system.

GENERAL EDUCATION.

The British Government has done much—far more than any previous Government had done—to spread education amongst the people. But what has been done is small as compared to what remains, especially in regard to mass education. There is no measure, which is more demanded by considerations alike of duty and self-preservation, as free general education, which will increase the efficiency and the capacity of the agricultural population and the artisan classes. It is real, solid useful instruction suited to their condition in life and helpful to the occupations which they have to follow, which is needed, but it is not given at present.

LOANS—LAND BANK.

The attempts which have been made till now to obtain capital on easy terms by the establishment of rural co-operative credit societies and loans under the Loans Acts have served a very useful purpose to the extent they have gone. But their operation has till now been of a very limited character. The conditions under which loans and advances for improvement are made, the rigidity of the system, the great delay which takes place in obtaining sanction and actual payment of the advances made, considerably curtail the usefulness of the measures and hinder due resort to the facilities such as they are given. Co-operative credit societies can produce little tangible effect on the condition of the agriculturists unless there is a net work of them throughout the country, and the capital at their command is many times increased. And this is only possible if land banks similar to that in Egypt are established in every province with the help and co-operation of the local capitalists. No scheme, which disregards this agency or acts in opposition to them, has any chance of succeeding or carrying real relief to the needy peasantry. The *sowkar* or *mahajan*

is a much maligned man who performs a most necessary function in our rural and urban economy, and whose aid is indispensable to the country's life. He has his faults and they are grave enough. But he is less unscrupulous than many a financial magnate netting millions of poor people's money while uttering platitudes of unctuous rectitude. If he has become exacting, if penal conditions are imposed in the bonds which he takes, let us in extenuation of his fault remember the law's delays, and its 'glorious' uncertainties, and the difficulty of obtaining satisfaction even after a decree. Many a banker or money-lender has expressed his readiness to me to co-operate in the establishment of a land bank advancing money at half the prevailing rates of interest, if facilities for recovery similar to those provided for the Egyptian Bank are accorded. The subject of a land bank for Madras as also for other provinces is under the consideration of the Government. It is very desirable that this Conference and all those who take interest in the improvement of agriculture should devote greater attention than they have been able to do, till now to this important matter, and move Government to take early action. One thing to bear in mind is that a scheme floated, financed and managed by a foreign syndicate will evoke severe comment, excite misapprehensions about the policy of Government and possibly rouse local opposition, which will endanger the success of the project. On the other hand it is more than doubtful if all the money required for making loans on easy terms can be obtained in India. It is the co-operation of both the Indian and the foreign capitalist that has to be sought.

SETTLEMENT OPERATIONS.

One cause of the ryot's chronic pecuniary difficulties and indebtedness lies entirely within the power of Government. The periodical and ever-recurring 'revision surveys and 're-settlements' are a fruitful source of harassment and hardship to the land-holding classes. It is not pos-

sible to go here into the controversial topic of a permanent settlement. A permanent settlement, pure and simple, such as exists in Bengal or in parts of the Madras Presidency, is out of question, and no responsible Indian politician or industrialist advocates its extension to the temporarily settled tracts. All that is asked is a modification of the existing system on lines similar to those set forth in the Resolutions of Lord Ripon of 1881 and 1882. A greater sense of security and a real immunity from unjust enhancements will be afforded if the principles accepted at one time by the Secretary of State and by the Government of India are given statutory authority.

SUSPENSIONS AND REMISSIONS OF LAND REVENUE.

The rigidity of the existing land revenue system has been pointed out by commission after commission. Even in the year of the most severe famine known to modern times, when in one of the most prosperous provinces in the country 20 per cent. of the population were on relief works, when in miles and hundreds of miles not a green blade was to be seen in the month of October, 95 per cent. of the land revenue was collected. It would be highly instructive if an investigation were made as to why no advantage was taken of the provisions of the Famine Code about asking the grant of suspensions and remissions. The Inspector-General of Registration of that province drew pointed attention in his annual report to the enormous increase in the number and value of mortgages executed in that year, and to the statements contained in most of them that the mortgage debt was incurred for maintenance and for payment of the Government revenue. An entire revision of the Government land revenue policy is demanded in the best interests of the Government and the people alike. There ought to be no necessity to point to a Government conducted on such enlightened principles as the British Government, that the real strength of the Empire lies on the hold it has on the affections and gratitude of the

people, and these can be secured only by demonstrating to them that their interests are protected to the fullest possible extent. The basal principles of Government ought not to be allowed to be disregarded or violated by exigencies of the hour or economic theories of individual administrators. It is necessary to emphatically speak on this point from this platform as the stability and prosperity of the staple industry of the country is a matter of supreme consideration.

Gentlemen, I have dealt at some length with agriculture. I make no apology for this as 66 per cent. of the population are directly concerned in it, and 16 to 20 per cent. in addition are more or less dependent upon it.

COTTON MANUFACTURING INDUSTRY.

Next in importance to agriculture is the cotton fabric industry which gives employment to nearly three million workers and supports as many dependents. This is probably the most ancient manufacturing industry which carried the name of India far and wide more than three thousand years ago. Till the beginning of the nineteenth century this country occupied a pre-eminent position in the production of cotton fabrics both as regards quantity and the almost unapproachable quality of the articles turned out. Up to the latter half of the 18th century, the European nations being interested in the increase of their trade with the East, the flow of Indian manufactured articles to the West was, if any thing, encouraged by them. With the acquisition of territorial rights in this country and the rise of the cotton fabric manufactures in England, an entire change came over the policy of Great Britain. For the purpose of developing the home industry every expedient of prohibition, high tariffs, and preferential treatment of British manufactures was freely adopted. As Professor Horace Hayman Wilson says, the British manufacturer 'employed the arm of political injustice to keep down and ultimately strangle a competitor with whom he could

not have contended on equal terms.' The remarkable progress of the mechanical and the physical sciences, the harnessing of steam and the extraordinary number of inventions inaugurated by Arkwright, Hargreaves and others completed the ruin. And now the country which not very long ago supplied the whole world with cotton textiles, imports over three crores of rupees worth of yarn and over forty crores worth of cloth. But we have no cause to despair, as the efforts commenced from 1854, to place the Indian industry on the same basis as the Western, are making hopeful progress. At present there are some two hundred and twenty mills with nearly five and a half million spindles and nearly sixty thousand power looms. These mills supply, however, a fraction only of the demand for cloth. Of the yarn produced in the country, which is about sixty crores of lbs., some sixty per cent. is consumed in home production and forty per cent. is exported. For the higher counts required for superior fabrics we have to depend upon importation from abroad. The hand-weaving industry, which produces cloth two and a half times as much as the power-looms, has for higher counts to rely upon yarn produced in other countries. Nearly two-thirds of the cloth requiring counts of higher denomination comes from abroad. The cotton grown in the country is incapable of supplying these higher counts, and those mills which turn out these higher counts have to get cotton from America and Egypt. The first desideratum for producing superior kinds of yarn is the growth of cotton capable of yielding these. The experiment of producing the Egyptian variety has succeeded in Sind, and experiments are being tried elsewhere for producing superior cotton by acclimatisation of promising exotics and by cross-fertilisation. The most serious factor, however, which has to be taken into account is the enormous capital—50 or 60 crores of rupees required for establishing mills which can turn out the quantity at present imported. It is impossible to find even a fair portion of this in the country.

The aid of richer countries possessing spare cash will have to be sought.

THE COTTON EXCISE DUTY.

Great as are the difficulties of the cotton manufacturing industry due to our being so far behind in the race, they are further enhanced by the jealous attitude of a powerful rival, and it has to submit to the imposition by its own Government of disabilities such as no nation had to contend against in recent times. Far from getting the protection and help which the industries of the United States and the continental countries of Europe have been getting from their Governments, and the propriety of which in the case of infant industries is admitted by John Stuart Mill, the most eminent of English economists, as also by Prof. Marshall, the greatest living authority on the subject, our cotton mills are subjected to peculiar disadvantages which are as unjust as they are irritating. With the abolition of the cotton import duties in 1879 at the dictation of Lancashire commenced a policy of injustice which has been carried further by the Tariff Act of 1894 and the Cotton Duties Act of 1896, under the first of which excise duties were imposed on all Indian goods which competed with Lancashire goods, and by the second on all cotton goods produced in India. For this most iniquitous of imposts for which Whigs and Tories, Radicals and Conservatives, are alike responsible, there is no parallel in any civilised country. Foreign yarn has been exempted from duty causing a loss of 51½ lakhs of rupees a year, and a burden which now amounts to 35 lakhs of rupees a year is imposed on the Indian power-looms. This is an injustice which should not be quietly tolerated any longer. Indians and Anglo-Indians are alike exasperated by it, and it is high time that combined and vigorous efforts are made by them to obtain the removal of a most unjust tax.

HAND-LOOM WEAVING.

The improvement of the hand-loom industry is demanded by various considerations. In the first place, five to

six millions of human souls are dependent upon it, and these eke out a bare subsistence with great difficulty. Secondly, it is more than doubtful if all these would find employment in power-mills even if the present number was doubled—an achievement not to be expected for years to come. The existing power-mills employ about 212,000 operatives while some 27 lakhs of workers are engaged in hand-weaving operations. Thirdly, it is by no means certain that the creation of huge establishments employing thousands of operatives working in crowded and unwholesome buildings, under conditions which at their best are inferior to the freer atmosphere and surroundings of a village cottage, is conducive to human progress. If without jeopardising the industrial progress of the country, a workable alternative can be offered to a system in which the worker is practically a piece of human mechanism, and which brings about the overcrowding of towns and prolonged absence from home resulting in disorganisation of family life, it does not deserve to be neglected or overlooked. The superior productive capacity of power-looms over hand-looms of improved types is not so great in finer fabrics and artistic cloth as in ordinary clothing; and on humanitarian and moral grounds it is very desirable that all the resources of science should be put under requisition to increase the efficiency of the hand-loom. I shall not recount here the various efforts which are being made in this direction. The exhibitions and competitions of improved hand-looms held in different parts of the country have demonstrated the feasibility of action in this direction. But the ordinary hand-loom weaver is exceedingly conservative and impervious to new ideals. And as in the case of the peasant, we must thrust on him the knowledge of things advantageous to himself. Exhibitions and competitions held in central places should not be expected to convey knowledge of the superiority of the improved types to the bulk of the weaving community, or to rouse them to adopt the new machine. This Conference and the organisations

affiliated to it should establish scholarships to be granted to one or two intelligent weavers from each of the different weaving centres which have not been touched, teach them how to produce on one of the new looms, the cost of which is within their means, the kinds of cloth which they have been accustomed to make, convince them by actual results of the superior advantages of the new types, and make a present to them of a loom like the Sayaji Cottage Loom, on condition that they would show the working to their fellow-craftsmen and teach any one wishing to learn.

MINES AND MINERALS. :

The next industry to which, on account of the magnitude of the present interests involved and the future progress of the country, it is necessary to advert is the mining industry. More even than in the case of the textile fabrics is the present condition of India unsatisfactory as regards this industry. At one time we occupied a prominent position in the metallurgical world on account of the high quality of iron made here and the application of processes for the manufacture of high class steel which have been adopted in the West in comparatively recent times. Artistic products in copper, brass and silver, gold and golden jewellery and the precious metals made the name of India famous. Important chemicals like nitre, alum, borax were exported on a large scale. Now, however, the trade in most of the chemical products is almost extinguished as in the case of alum, copperas, blue vitriol, &c., or has seriously gone down as in the case of nitre. There is hardly any iron produced in the country except in exceedingly few cases, and very minute is the quantity of iron prepared by the old smelting processes; while copper and brass vessels which are wanted for the daily use of the people are all made from imported sheets. The dependence upon the foreign article is still an increasing one. Excluding hardware, cutlery, machinery, mill and railway plant the value of imported mineral products was in 1907 nineteen

crores of rupees. The value of iron and steel imported was in 1907-08 nearly five crores, machinery and mill work over six and a half crores, railway plant and rolling stock nearly seven crores and a quarter (being three crores and a half more than in 1906-07 and over five crores and a half more than the average of the three preceding years). Hardware is nearly three crores, copper over two crores. The decadence of the indigenous industries and the ouster of country-made articles by foreign ones, is due to the extraordinary strides made by the West in the physical sciences and in their application to industries. Our capability to establish a prosperous manufacturing system, self-contained and duly correlated, depends mainly upon our success in reviving the iron and steel industry. At present there is only one iron work where iron smelting according to modern processes is being carried on. But this establishment also is of dimensions which are moderate as compared to the huge ones of the West. The project started by that great and good man the late Mr. Jamsetji Nasarwanji Tata (to whom gratitude is due from his countrymen for more than one beneficent project) and the members of his family will be the first which will carry on work on a sufficiently considerable scale. Modern conditions of the manufacture of this metal require huge capital, to be measured by crores. This is our greatest difficulty, and next to it is want of scientific knowledge and technical training. So far as the field for operations is concerned, it is rather restricted because to be paying it is necessary not only that the ore should be of a high grade, that the iron-ore-yielding area and the coal-producing area should be in proximity, but the coal must be capable of coking. Much of the Indian coal does not coke. For our present purposes, however, the fields where an iron industry can be established are sufficiently extensive to meet the demand that might be made upon them for several years to come.

The mining of manganese ore has progressed enormously during recent years. Sixteen years ago India produced

no manganese ore. Commencing with three thousand tons in 1893 the output has gone up to five and three-fourths lakhs of tons, whose value at the place of production comes to about eighty-six lakhs of rupees. All this material is exported to Europe. A fair portion of this would certainly be capable of being utilized in the country if a steel industry of any dimensions is established. There are fairly rich copper fields which are not and cannot be worked for want of knowledge, want of capital and enterprise, and because the bye-products cannot be remuneratively utilised. It is only by the creation of connected industries and trades in a well planned and methodical manner that any one of them can have a healthy life. With one important exception such mining operations as are carried on relate for the most part only to products which like coal and petroleum are consumed in their natural form in the country or are exported abroad as materials to be worked up in far distant lands.

One noticeable fact of recent years is the revival of the gold mining industry. The working of gold mines is now carried on on a fairly large scale in the Mysore territory, and beginnings have also been made for extracting it in the Southern Mahratta country and the Hyderabad State. The annual output of gold has now reached the value of 3.35 crores. The industry, however, is looked at with considerable shaking of the head and regarded as a typical illustration of foreign exploitation. Not one of the mining companies is Indian. The total value of gold raised during the quarter of a century that the Kolar Gold Fields have been at work, is roughly forty crores. Out of this only 1/19th or a little over two crores represents royalty, and nearly 50 p. c. has been distributed among the shareholders as dividend. The benefit to the people consisted only in the wages to labourers and clerks. There is neither the pecuniary gain from proprietorship, nor the valuable moral asset of training and experience in the scientific operations and the directing and controlling work. While the development of the mineral resources of a country is most desir-

able, care must be taken that too great a price is not paid for it. In view of the fact that minerals cannot be replaced or replenished a special, heavy responsibility lies upon both the people and the Government. The desire to stimulate production cannot justify the complete handing over of mines to persons who have no permanent interest in the land. On the one hand our people ought to realise that in the interests of the country itself our minerals have to be worked. No serious harm certainly can result from postponing for even a quarter of a century the extraction of precious metals like gold and precious stones like rubies or diamonds. But coal, iron, copper and all other like substances, which are articles of manufacture or help the processes of manufacture, are urgently demanded. If we do not show enterprise and energy, if we do not equip ourselves with the requisite knowledge and working capabilities, if we do not find the needed funds, there is imminent danger of outsiders reaping the entire benefit which the country's mineral resources are capable of yielding. On the other hand, as trustees of the permanent welfare of the Indian people, the Government should recognize the serious injury that would be caused to those interests from exploitation by outsiders who have no permanent stake in the country. This is not a question of colour, race or religion, but of Indian (including in that term domiciled Europeans and Eurasians) *versus* foreign capitalists. There is no analogy between the grant of mining rights to strangers and the borrowing of loans in foreign countries or the starting of manufactures with the help of foreign shareholders. These latter only receive interest or fair profit. The corpus of the loan or invested money continues to exist in the form of machinery, buildings and working capital. All this money reproduces itself, and what go to the outside creditor or absentee proprietor are the annual profits. The foreign owner or lessee of a mine, however, takes away the permanent wealth of the country without leaving any equivalent. What he takes away is lost to it for ever.

It is high time that action is taken by our people which would, if not put a stop to, at least minimise exploitation by outsiders. It would not be asking too much of Government to give preference to Indian applicants (including resident Anglo-Indians) over foreigners in the grant both of prospecting licenses and mining leases, and to further lay down a condition that in the case of a projected foreign company half its shares shall be placed on the Indian market, and that Indian shareholders shall have a proportionate representation on the managing board. There is no reason why as in Japan a minimum amount of 30 p.c. of the capital of a mining company should not be reserved for the men of the country, or why the Government itself should not work all those mines for which capital cannot be obtained on the terms mentioned above.

SUGAR.

The next heavy item of our import trade is sugar. Till not very many years ago the people of India supplied themselves with the sugar which they consumed, and large quantities were exported abroad by the East India Company. The fate that befell the cotton fabrics trade overtook the sugar trade also. Beginning with the importation of small quantities of refined Mauritius and West Indies sugar, the process of the ouster of the indigenous product by the foreign article has gone by leaps and bounds. Refineries after refineries in this country have been obliged to stop work or contract their operations. In 1895 there were 247 sugar factories and refineries. The number fell down to 203 in 1900. The smaller concerns are no longer registered but the larger ones number about 30, and now sugar forms one of the largest items of the import trade. The value of sugar imported in 1903-04 was Rs. 6 crores 3 lakhs; 1904-05, 6 crores 55 lakhs; in 1905-06, 7 crores 69 lakhs; 1906-07, 9 crores 53 lakhs; in 1907-08, 10 crores 4 lakhs. In the first six months of 1908-09 the value of the article imported was 4 crores 3 lakhs as against 3 crores

and 75½ lakhs in the corresponding period of the last year. The quantity which came in the month of October was of the value of one crore 63 lakhs being an excess of 36 lakhs over that imported in the corresponding month of last year. These are figures which ought to make our people seriously pause and reflect. There is no question that in the greater part of the country, and amongst numerous classes, there is a most genuine and earnest desire to discard foreign sugar and to give preference, from religious scruples and patriotic considerations, to the home-made article. But this wide-spread movement has not checked the importation of the foreign article. The reason is not far to seek. In a mofussil station on the main line of one of our trunk railways, foreign refined sugar has been selling at the rate of Rs. 9 for every maund of 40 seers, sugar vouched as made in India by modern processes sells at the rate of Rs. 12 per maund, while what is called Benares sugar—that is the sugar made by the indigenous process—sells at the rate of Rs. 16. It is devoutly to be wished that our people will see the true significance of these figures and lay to heart the lesson which they convey. Enthusiasm or self-sacrificing zeal alone will carry us a very small way. It is only by establishing conditions which can permit the sale of the home-made articles on the same terms as the foreign, that it is possible to ensure the existence of the home industry. If cheap beet-root sugar from the continent of Europe, or the cane sugar made in Java by the most economical and efficient modern processes, continues to be put on the market at prices which are 25 to 80 or 90 per cent. below those of the Indian product, the prospect before the latter is most dismal indeed. This is hardly to be wondered at. The outturn of raw sugar per acre in India is 1·25 tons, as compared with 2 tons in Cuba, 3·44 in Java, and 4·02 in Hawaii. A ray of hope is afforded by the satisfactory working of some of the larger sugar factories and by the efforts which, under the orders of the United Provinces Government, Mr. Hadi is making. The detailed account

given in his latest report of the demonstrations made last year under considerably depressing circumstances, when in seven establishments the operations carried on yielded from 11 per cent. to 67 per cent. of profit, is indeed a cheering message. At the same time it is necessary to recognise that there are some experts who question the commercial value of the Hadi process. Recent demonstrations made in Poona also showed that it is more paying to the ordinary refiner to prepare raw sugar (jaggery) than the clarified article. Larger areas for sugarcane cultivation, growth of superior varieties, the cultivation of beetroot, greater utilization of date palm juice, the establishment of factories and refineries carrying on operations with up-to-date appliances, will alone ensure the revival of this industry. At one time it looked as though beet sugar would put down cane sugar. But the steady progress of the Java industry has shown the capacity of the latter to hold its ground. In this country the importation of Java sugar has during the last five years increased from cwts. 1,335,548 to 6,507,754. The proportion of cane sugar to beet sugar was as follows during the last three years : 42 to 34, 59 to 38, 92 to 7.

One serious hindrance to the revival of the sugar industry is the difficulty about the utilization of bye-products. The Excise laws do not permit the manufacture without license of rum or other form of alcohol and prayers to Government to lessen the rigour of the rules in favour of sugar refineries have till now evoked no favourable response. This attitude stands in need of change.

OILS AND OIL-SEEDS.

The trade in oil-seeds and vegetable 'not-essential' oils also illustrates in a typical manner the prevailing feature of the present industrial situation. Oil-seeds have for years past been exported in large quantities and the trade has been, in spite of temporary fluctuations in particular commodities, advancing year after year. In 1903-04 the value of oil-seeds exported was 14½ crores of

rupees. In 1907-08 it was 16·8 crores. The export trade in oil, however, has been steadily going down; and during the last five years it has sunk from 83 $\frac{1}{3}$ lakhs to 50·8 lakhs. On the other hand the imports of seed oil have increased from 9 $\frac{1}{4}$ to 37 $\frac{1}{2}$ lakhs. A country which sends from 5 to 6 crores worth of linseed receives from England (which takes about 2 crores worth of the seed) oil which in 1904 was worth Rs. 4·8 lakhs, and in 1908, 6 $\frac{1}{4}$ lakhs. The nations of the West are with the aid of science able to take the raw material from here to a distance of 6,000 miles, prepare there the finished article and put it on our market at a considerable profit. With powerful labour and time-saving mechanical appliances and a treatment of the seed which gives a larger outturn, they are able to undersell not only the village oilmen but the power-driven presses also. In various parts of the country there are oil-mills established, but they are not as flourishing as they once were. Partly owing to unfavourable harvests, partly to a deterioration in the quality of the seed, partly to absence of scientific knowledge and training, the paying character of the industry has declined. The industry cannot be established on a firm basis unless the present scope of work is extended and connected industries, like paints, varnishes, candles, soap are organised. The exportation of vast quantities of oil-seeds has produced two very disquieting results, the diminution of cattle food and loss of manure, both which purposes are fulfilled by oil cakes. The expansion of this industry is thus desirable in the interest of agriculture also.

MANURES.

In connection with this it would be appropriate to notice the yearly increasing exportation of manures and manure-producing substances like bones. The export of this last article has already reached 55 lakhs. The total value of manures exported reached the value of 101 $\frac{1}{3}$ lakhs in 1906-07. In a country where the soil does not get

sufficient manure the sending out of such a quantity of it cannot be regarded as a healthy indication. Owing to the absence of chemical industries, a cheap supply of chemicals needed for treating bones and like substances is not available.

TANNING AND LEATHER DRESSING.

Another industry which deserves more than a passing notice and which, with the adoption of scientific processes and combined action, is capable of development is the leather industry. During the last three years the average export of untanned or undressed hides and skins was of the value of about 9 crores ; dressed or tanned hides and skins of the value of about 4 crores are exported. We import leather and leather articles of the value of about a crore of rupees. Action requires to be taken to increase the efficiency of the tanning and dressing occupations and of the manufacture of leather articles. The work carried on by the Government of the Madras Presidency through their special industrial officer Mr. Chatterton has demonstrated that this trade can be revived and put on its former basis. The Governments and leaders of the other provinces have only to follow in the footsteps of Madras.

OTHER INDUSTRIES.

I have referred to only a few industries to give an idea of our present economic condition. The others which remain to be mentioned, unfold for the most part the same tale of extinction or decay. Silk and woollen fabrics, lace making and embroidery, wood and ivory carving and inlaying, lac and laquer work, dyeing and printing, paper, glass or pottery, all are leading a precarious life. Several forest and field products have lost their value—their place being taken by cheap artificial preparations. Three new industries—jute, tea and coffee—have arisen. But these too illustrate the transformation,

THE EXPORT AND IMPORT TRADE.

We have a fairly large volume of export and import trade, the value of which excluding treasure and Government transactions came in 1907-08 to about 130 crores for imports and 173 for exports of Indian merchandise. Considering, however, the size of the country and the population, it cannot be called large and is really much less than that of the United Kingdom, the United States of America, France, Germany and other progressive nations. Apart from its volume, there are several features in it which are unsatisfactory and some disquieting. The only completely manufactured articles which are exported in any considerable quantity are jute goods which last year came to 18.29 crores of rupees, cotton twist and yarn which came to 8.97 crores and cotton piece-goods and other stuffs 1.79 crores. Manufactured silk came to only 8.31 lakhs and woollens 27.19 lakhs. Manufactured articles proper represent only about 30 or 31 crores or between $\frac{1}{8}$ th and $\frac{1}{6}$ th of the total exports. Even if partly manufactured goods like tanned hides and skins and lac are included, manufactured exports constitute between $\frac{1}{8}$ th and $\frac{1}{4}$ th of the total merchandise exported. The bulk of the exported articles consist of food stuffs and raw materials of manufacture. The imported articles, on the other hand, are for the greater part manufactured goods. This trade again is carried in ships only an insignificant part of which is Indian. While the total tonnage of European and non-Indian vessels employed in the foreign trade was in 1906-07, 13,605,304, the Indian crafts represent only 170,132 tons or between 1.3 and 1.4 per cent.

OUR WORK.

If India is to be brought on a level with the advanced nations of the West and the farthest East, action is demanded all along the line. The production of food stuffs and of raw materials of manufacture grown on land has to be stimulated and increased, and the quality improved. Forest

products, which are ceasing to have commercial importance before the competition of cheaper substances prepared with the help of chemistry, are to be rehabilitated and rendered capable of use under the new conditions. A properly co-ordinated manufacturing system has to be established or expanded for raising those finished articles for which suitable material is available. The mineral resources of the country are to be developed and utilized for the benefit of the people, and a mercantile marine has to be created for carrying on coasting trade and trade with other nations. This is stupendous task. But if other nations who laboured under even greater disadvantages were able to accomplish it, we have no occasion to lose heart. It is not a hundred years when Germany or America had no manufactures worth taking into account and both have now built up an elaborate and extensive system which has roused apprehensions even in England. The preparation of synthetic dyes which have put down indigo and other natural colours, and the manufacture of beet sugar represent triumphs of science of which any nation can be proud.

Their progress is due to the cultivation of the natural sciences and their application to industrial purpose.

SCIENTIFIC AND TECHNICAL EDUCATION.

As in those countries a complete system of scientific and technical instruction has to be established. Polytechnic institutes, engineering colleges, chemical-industries colleges, agricultural and sylvicultural colleges, commercial colleges must be established. The land must be studded with industrial and crafts schools. Trained captains of industries, trained masters, supervisors and assistants, equipped with the knowledge of the principles underlying their industries, and furnished with practical skill, and operatives with their general intelligence developed and their efficiency cultivated are needed. Till a few years ago there was hardly any institution capable of supplying this want. It is only very recently that the Government and the leading men of the

country have been roused to a perception of the necessities of the situation. Some steps have been taken of recent years and greater activity has been displayed during the last two or three years. What has been done, however, is small in proportion to what still remains to be accomplished. There is no institution for instruction in marine engineering or in the numerous departments of industrial chemistry. In mining and metallurgy only a beginning and a very small beginning has been made. In practical electrical engineering there is only one institution where something is being done. Even in mechanical engineering which attracted attention twenty years ago, the provision made suffices only to supply a class of supervisors of boilers and engines. The higher branches have yet to be reached. After twenty years of discussion and promises very little has been done in Bengal. The Serampur School of Hand-loom Weaving still remains in the region of chastened hope. The provision in the Madras Presidency has yet to be brought up to a due level. It is pleasing to note at the same time the great step forward taken by that Government in holding the Ootacamund Conference and the action taken by the Governments of Bombay, the United Provinces and the Central Provinces. The scheme for founding a college of technology at Cawnpur at an initial cost of Rs. 14½ lakhs and a recurring expenditure of 4½ lakhs a year has now gone to the Secretary of State.

What is most needed are a dozen at least of high class technological colleges where the highest technical instruction will be given in *a*) mechanical, electrical, mining, railway and marine engineering, (*b*) in textile manufacture, (*c*) in mining chemistry and metallurgy, and (*d*) in the numerous departments of industrial chemistry having reference to food and food stuffs, oils and fats as required for edible, illuminating and lubricating purposes and for preparing paints, varnishes, soaps, &c., tan dyes, sugar, essences and scents, paper, glass, chemicals and drugs. The selection of departments must vary with the conditions of

each province. But provision for instruction in mechanical and electrical engineering and the branches of industrial chemistry, suitable to the prevailing industries, should be made in each province. Completely equipped laboratories and workshops containing every kind of machinery and up-to-date appliances should be attached to such institutions. There should be scope not only for a pre-graduate but also for a post-graduate course, and due provision must also be made for the conduct of investigation and research.

The promotion of higher scientific and technological knowledge is the most efficacious way for advancing industries. It is the capacity of the men at the top, their knowledge, resourcefulness and inventiveness that stimulate existing industries and facilitate the establishment of new ones. The Royal Commission on Technical Education pointed in their report in more places than one, to the extraordinary progress of Germany and the other continental countries, in proof of what scientific and technical education is capable of doing. The enquiries made by the Moseley Commission have placed it beyond question that the remarkable prosperity of the American industries is mainly attributable to the high class education—theoretical and practical—insisted upon in that country in the supervising and directing agency.

In regard to Commercial Education a beginning should be made by creating a Faculty of Commerce in one at least of our Universities (and this would necessarily be Bombay) and establishing affiliated colleges in that city and in cities like Calcutta and Cawnpur. It is hoped that the action taken by the Government of Bombay in arranging for the lectures which Prof. Lees-Smith has been delivering is a step in that direction.

Secondary technical and industrial schools in each division, and elementary crafts schools in each district, represent our minimum requirements in those courses. At the foundation of the whole system is general elementary education which should be provided free by the Govern-

ment and the Local bodies. Our entire educational curriculum requires to be remodelled, our ideas of instruction require to be recast. Drawing and manual training must form a necessary portion even of the literary course, for the training of the eye and of the hand is as much wanted as the development of the brain. The teaching of science must be far higher and far more general than what it has been till now. And every man of education must be much better fitted than at present to cope with the conditions of latter day life.

Till such time as a complete system is not established, the State Scholarships instituted by the Government of India afford the means of acquiring the knowledge and experience which is not available in this country. But the need for such instruction in other countries will remain even when technological colleges for all branches are provided.

This might be considered a large order but it is not more than what is done by the State in Germany, Japan, England and America.

But after all our salvation depends, not so much upon what the State will do, but upon what we are prepared to do ourselves. No number of technical institutes will be of any avail to us unless our very best men are imbued with the true scientific spirit. We are apt to find fault with this thing or that. But have we done all that lies in our power? Have we turned to account all the discoveries of science? Do we appreciate the fact that we have advantages such as very few other nations have? There are natural forces which we have never thought of putting to the use of man. There are vast stores of energy running to absolute waste—the very best amongst us not giving till the other day a moment's thought to them. The torrential rains which fall on the Western Ghats and in the mountains of the North-east are, if collected and the stores suitably directed, capable of yielding motive power sufficient to drive thousands of huge factories, and, after serving that

purpose, of irrigating millions of acres as well. Let alone artificial reservoirs. There are natural streams, rapids and waterfalls capable of supplying motive energy. The heat of the tropical sun is a veritable storage of power which is absolutely unutilized. Our ignorance of science, our antiquated ideas, our obsolete methods are more responsible for our poverty than all the other unfavourable factors taken together. Passionate devotion to science, gentlemen, is what India needs most at the present day. The brightest and the most capable of her sons must worship in that temple.

We have a J. C. Bose and a T. K. Gajjar, men of whom the whole scientific world must feel proud. But we want more Boses and Gajjars. And here, gentlemen, I would on behalf of you all offer congratulations to a countryman—Prof. Blise of Bombay, who has just returned from England after having perfected a new machine which promises to revolutionise the art of printing through the novel and original processes invented by him in regard to type-casting and type-setting.

CAPITAL.

The want of capital and enterprise is, equally with backwardness in the application of scientific knowledge and methods, responsible for our unsatisfactory condition. The people of India are essentially poor. Men counted rich here would in England be hardly considered as possessing a decent competence. The timidity of capital is even more pronounced than its deficiency. There is a very prevailing disposition to invest one's savings in the Postal Savings Bank or in Government Promissory Notes at 3 or $3\frac{1}{2}$ per cent. interest, rather than put them in industries or advance loans out of them on more remunerative terms for manufacturing or commercial purposes. It cannot however, be denied that there is some justification for this disinclination. More than one concern has come to grief, often through ignorance, on many occasions through

mismanagement and dishonesty. It can only be by the formation of Joint Stock Industrial Companies by the most capable and trustworthy people, and by the establishment of Joint Stock Banks started and managed by men of high character and experience that this source can be tapped. But even with its aid the supply would not be adequate to the requirements. Natives of India own only 58·60 crores of the 'Rupee debt' and 13·52 crores of the Savings Bank deposits. The total amount of deposits in the Presidency, Exchange and Joint Stock Banks amounted in 1906 to 57 crores. This whole amount did not belong to natives of India and we shall not be far beyond the mark if half of this is taken as belonging to Indians. Not even a half of these deposits can be expected to be available for industrial purposes under the most favourable circumstances. It is thus on outside capital that we must draw for help. Such capital will be forthcoming only when there is a Government guarantee or there are large national or provincial banks whose capital, resources, sound administration and character have succeeded in creating confidence in foreign countries. Organization within the country and the credit acquired by honest, careful and wise management are the things we must aim at. In other words our most capable and trustworthy men must put their shoulders to the wheel and establish for the nation a high commercial character.

RAILWAY RATES.

One adventitious circumstance which considerably hampers the expansion of Indian industries is the high tariff scale of Indian railways. The freight charges on goods levied by these railways on inter-provincial consignments are so exorbitant, that transport expenses over a few hundreds of miles in India are often more than those on shipments sent from a distance of six thousand miles. The question of railway tariffs in this country is one which calls for the intervention of Government. In other countries

the interest of commerce is treated in a helpful spirit by the subsidised railways. In India the State Railways and the Railway Companies which receive their guaranteed interest from the public revenue are disdainfully disregarding of the interests of manufacture and trade. This is a subject which deserves to be taken up by our Conference and the commercial community.

UNIFICATION OF WEIGHTS AND MEASURES.

Another anomaly to which I would call your attention is the bewildering diversity of Weights and Measures. The importance of unification of weights and measures was in England insisted upon so far back as 1216 A.D. The question of standardization of Weights and Measures was before the Government of India a few years ago and opinions of Government officers and non-official persons were invited. I believe there was a consensus of opinion in favour of the measure. It is very desirable that standardization and unification are established.

GOVERNMENT STORES.

In a country situated as India is, a special responsibility lies on the Government to promote the expansion of commerce, the revival of old industries and the establishment of new ones. This responsibility has been kept in view in the matter of railways, canals, the tea and coffee industries and the growth of superior varieties of cotton. But little has been done to give support or encouragement to the manufacturing industries. At times resolutions were issued directing the various departments to purchase India-made articles in preference to foreign ones, if the quality and price were the same; but it does not seem that much effect was ever given to them. More than two years ago the Government of India appointed a Committee 'to ascertain definitely the procedure which in practice is adopted at present for the purchase of stores' for Government departments. The Committee was asked, among other things, to report on the question 'of affording

greater encouragement to local industries' on 'the advisability of prescribing strict rules requiring Government officers to purchase locally manufactured articles in all cases, where such articles are available, and of calling upon them for explanation in cases where these rules are transgressed'; and 'on the advisability of devising a system under which all departments of Government will be informed of the adoption of a local, in place of an imported, product in any part of India.' It is a matter of general knowledge that the Committee drew up and sent in its report at an early date and that the Government of India sent the same on to the Secretary of State. But though two years have passed it has not been published and no action has been taken in regard to it. Excluding railway material imported by Government the value of Government stores is about 4 crores a year. The value of the Railway plant and rolling stock imported during the last five years by Government and the railway companies was 5·63, 5·60, 6·73, 8·48, 9·88 crores. The bulk of this came from the United Kingdom. We can well understand why the India Office is unwilling to let the Stores Committee's report see the light of day.

PLAN OF OPERATIONS AND AN ADVISORY BOARD.

.. Our limited resources, the prevailing tendency born of inexperience and past failures and disappointments to regard with misgivings and hesitation any new project, and the conditions of success itself, impose a duty upon our leaders to bestow the utmost thought and informed deliberation they can to determine the course of action which ought to be followed. A complete and fully elaborated plan of operations should be drawn up for each province, nay for each district. The existing industries which are capable of improvement, the decadent ones which can be revived, the new ones which can be established should all be noted down in due order of importance and prospect of immediate success, the localities suitable the most efficient

appliances and methods, the minimum capital required for a paying concern, the sources and cost of labour should all be stated. Such a plan would be a light to guide the steps of those who want to walk in the path of industrial enterprise. This is the least that is demanded of Government and of the men of light and leading of the community. There should be for each province a Director of Industries like the one appointed by the Government of Madras and there should be associated with him a small committee of from 8 to 12 (half of whom at least should be Indian non-officials connected with industries or commerce), who should, after a study of all the available material, draw up such a plan of operations, and should serve as a standing committee of reference to all who want information. The trials for testing the commercial success of a new undertaking recommended by the Committee on Industrial Education and carried out by the Government of Madras in regard to aluminium, chrome-tanning and hand-loom should be conducted under this officer and the Committee associated with him. The Industrial Surveys which have been carried out in the United Provinces and Bengal, the one which is being carried out in the Central Provinces and Berar, and those which are expected to be carried out in the other Provinces, will supply a mass of material which has itself to be further sifted, classified and co-ordinated. With the aid of the information thus collected, of the practical proofs afforded by the Exhibitions which have been held since 1901, and applying their own knowledge and experience, the Committee will be able to formulate recommendations which will secure systematic action on sound lines, and obviate the chances of loss of capital, and the consequent demoralisation.

EXHIBITIONS.

In connection with this I would express the hope that the industrial and agricultural exhibitions which for six years formed a fixture of the Congress and Conference weeks, will be revived. These exhibitions serve a very useful function.

They enable us to take stock of what has been achieved, to find out what remains to be done and the materials and appliances available for it. Popular interest is stimulated and enterprise and inventiveness are encouraged and a general atmosphere of activity created. The successful Exhibition which is being held at Nagpur is an apt illustration. One of the most beneficial indirect effects which such undertakings produce is the friendly and harmonious relations they bring about between officials and non-officials, between Indians and Europeans, in a sphere of great public importance.

CONCLUSION.

The Industrial Conference has been in existence for three years and it is time that those interested in it take a further step to increase its usefulness to the nation. The work of collecting information from qualified persons, the discussion of important subjects demanding immediate action, the task of disseminating knowledge of our industrial products raw and manufactured and of the agencies of instruction has of course to be continued and widened. It is now necessary to create local organizations which will take charge of actual work, form companies, promote the establishment of manufacturing and commercial concerns and create general industrial activity. This requires money, and, more than money, men—men endowed with public spirit and prepared to make personal sacrifices for the country's good. On our ability to rise equal to this emergency depends our healthy life and progress. Our future is in our hands. Free scope and fair and sympathetic treatment we are entitled to receive from Government, and with the solemn confirmation which the recent Royal Message has given to the noble Proclamation of 1858, it is to be expected that no Government of India, no provincial Government will lose sight of the great political truth proclaimed by Her Gracious Majesty in the memorable words 'in their the subjects') prosperity lies *our* strength, in their contentment *our* security, and in their gratitude *our* best reward.'

Gentlemen, the fate of a nation lies in its own hands. Its greatness depends upon its self-reliance, wisdom, sobriety, earnestness and moral fervour.

We are face to face with a militant civilization whose watch-word is efficiency and which fights with the weapons of knowledge and strenuous exertion. Our advance will be commensurate with our acquisition of this efficiency, this knowledge, this capacity for strenuous exertion. (*Loud and prolonged cheers.*)

[Immediately after the President's Address was over, Their Excellencies left the Conference escorted by the Chairman, Secretaries and some other leading members of the Committee.]

The Annual Report.

Dewan Bahadur AMBALAL SAKERLAL DESAI then presented the Report of the work of the Indian Industrial Conference for the year 1908.*

In doing so he said :—

In presenting to you the report for the period which covers the 11 months of this year, I am not going to read the whole of the report. The Secretary Rao Bahadur R. N. Mudholkar and his assistant Mr. C. Y. Chintamani have done very useful work during the year. Mr. Chintamani travelled through the whole of India from Ahmedabad to Calcutta, and Mangalore to Lucknow, including several places in your Presidency. I might refer to the handloom competition at Surat. The Directory of Indian Goods and Industries had a very rapid sale, the whole of the second edition being sold out. There was another directory, a Directory of Technical Institutions containing important information. Industrial Conferences were held in several parts of the country—in Bengal, in the United Provinces, in Behar. The appendices will be found most useful. They show the activities of the British Government and the Governments of several Indian States. The most interesting

* This is printed at the end of this Report.

portion of the report to us is the commercial activity of the people. During the year something like six crores of rupees have been invested in industrial undertakings. The accounts are also presented in the report. With these remarks I leave the motion for the adoption of the report to my friend the Honourable Sir Vithaldas Thakersey (*Cheers.*)

The Honourable Sir VITHALDAS THACKERSEY, in moving the adoption of the Report, said :—

Mr. President and Gentlemen,—The resolution for the adoption of the report in previous years was put from the chair and carried. This time as you know, our Secretary is also the President of the Conference and the pleasant duty of moving the adoption of the Report which has just been placed before you by Dewan Bahadur Ambalal has come to my lot. The progress during the last year, as Dewan Bahadur Ambalal has pointed out, is very great whether we look at the work done by Government or at the work done by private enterprise. We see progress everywhere. There is mention in the report of a match factory. Having studied this subject at great length, I am tempted to give my experience in the matter. We are all talking and seriously thinking of introducing new industries in India. While I was going through the figures of the imports of different foreign articles with the same idea in mind, it came to my notice that nearly 51 lakhs worth of matches were imported into India last year. It was a very large quantity and most of the matches came from Sweden and Japan. Naturally it occurs to one that where we have sufficient capital for a match factory and where there is ability, there is no reason why a match factory in India should not be a success.

But before we go and put our money into a concern it is necessary that we should be satisfied as to the return we should get and as to how we should act in the matter. The first thing to do was to get an expert from Germany

to test the several kinds of wood in the Indian forests and I am very glad to inform you that we have been able to get suitable kinds of wood for match making, boxes and splints. The essential condition of the success of a match factory is to get suitable kinds of wood, and in sufficient quantities to feed the factories for a number of years. It is not possible to import wood from a district thousands of miles away and there make boxes or splints. In the match factories started in India some of them are manufacturing from woods which are not first class and that is the reason why they have not been able to drive away imported matches. As I have told you there must be sufficient and good wood and the samples we have had are as good as any imported matches. The idea is not an absolutely selfish one. The idea in starting this large factory is to enable matches to be made for the whole of India and have match factories in every centre of India. It is the difficulty and the expense of carrying finished matches from one district to another which is an obstacle to success. But when each centre has a small machinery for making matches with ready-made splints got from a central factory, you can easily compete with the imported articles. These are the general outlines of our scheme. And in an experiment like this we have thought that instead of going to the public we should form a syndicate ourselves and so we have decided to do. We only hope to be able to supply splints to the whole of India and also machinery to make matches. Before going further I may inform you that the manufacture of machinery is also of considerable interest in the matter. We have the best expert advice in getting the best machine and he will also be the general adviser for small match factories in India. Further we are also starting a large up-to-date factory for making splints that would supply all India. As I am not asking for money or putting forward a share list, I have thought I may give you the experience we had during the last year.

The other matter in regard to which the report shows

progress relates to the expansion of joint stock banks. Both the banks in Bombay with capitals of a crore and a crore and a half have done well during the year and the one in which I am interested made during the last nine months nine lakhs on a paid-up capital of 75 lakhs. I give you these figures not with any pride or vanity but as it is good to emphasise the fact that there is a bright prospect for banking in all India. If with good management and large capital you go to the public and do large business you are sure to be successful. The only difficulty which banking institutions have is want of large capital. What we want is that the public should know how much money is invested by the shareholders, and the larger the money invested the greater the confidence we can command, and ultimately we can do a large amount of business for the profit of the shareholders.

I may refer now to the accounts which the Secretaries have placed before you. Although our able Secretary is able to do the utmost with what little funds he had, there is no doubt that if a larger sum had been placed in his hands he would have been able to do much more. The idea of starting a quarterly bulletin giving all information about industries has been kept in abeyance owing to want of funds. When looking into the accounts we find that the total receipts in 1907 including the opening balance were about Rs. 7,000, that of this the subscriptions came to about Rs. 3,720, the Bombay Presidency contributing 65 per cent. of this. I hope that if Bombay itself does its utmost to give its full share for conducting the daily routine work of the Secretary's office the other Presidencies will come forward and equally help the good work. I am sure that if all the provinces came forward liberally we can get ten thousand rupees next year which will be sufficient to carry out all the ideas which the Secretary has of giving more information to the public and carrying out the objects which we all have so much at heart. With these words I beg to move the adoption of the report. (*Cheers.*)

Dewan Bahadur K. KRISHNASWAMI RAO (Madras) in seconding the proposition said :—

I have great pleasure in seconding the proposition moved by Sir Vithaldas Thackersey. I have nothing to add to what he has said—I am not an industrial man. I recommend the adoption of the report.

The PRESIDENT then said :—

The report has been presented to you by our last year's President Dewan Bahadur Ambalal Sakeral Desai ; its adoption has been moved by our friend Sir Vithaldas Thackersey and it has been seconded by Dewan Bahadur K. Krishnaswami Rao. Is it your wish that this report be adopted ?

Cries of ' yes, yes '.

The PRESIDENT—Any one against it.

Cries of ' none.'

The PRESIDENT : The report is adopted.

We shall now adjourn for lunch as usual.

The Conference adjourned at about 2-20 P.M.

The Conference re-assembled after lunch at about 3 P.M.
The PRESIDENT said :—

We have received a number of papers from gentlemen who have devoted themselves to the study of the subjects connected with the industries of this country. They have been kind enough to take the trouble to write the most informing papers for us and some of them have at our request kindly attended this meeting. It is of course not possible to have all those papers read to you, but I would on behalf of all of you request the gentlemen present to kindly give us the purport of the papers which they have kindly prepared. Copies of them will be afterwards distributed. The gentlemen who are present will kindly give us the benefit of hearing the chief points of their papers.

THE PAPERS.

TWENTY-FIVE YEARS' SURVEY OF INDIAN INDUSTRIES.

BY V. G. KALE, ESQ.,

Professor, Fergusson College, Poona.

It was exactly fifteen years ago that a master hand drew a vivid and careful picture of the industrial condition of this country as seen at that time and exhibited it before a similar gathering in the capital of Maharashtra. Mr. Justice Ranade showed, in a paper which he read in 1893 before the Industrial Conference in Poona and which has been embodied in his *Essays on Indian Economics*, that the process of 'ruralisation and rustication', which had been going on in this country for a century and more, had at last received a check, and people had come to recognise the importance of adopting modern methods of manufacture and the necessity of seriously applying themselves to the revival and encouragement of indigenous industries which had already died out or were on the way to extinction. A robust optimist by temperament and a keen observer by nature, he saw clearly signs of movement in the right direction and predicted that, if that industrial activity was persevered in, in spite of our manifold difficulties and drawbacks we were sure in a few years' time to be on the high road to the realisation of our cherished object. From a comparison of the trade returns of the year 1892-93 with those of fourteen years previous, and from a general survey of the nascent industries, he came to the hopeful conclusion that the transition of India from a purely agricultural to a partly manufacturing and trading country had commenced, and that the outlook, on the whole, was decidedly cheerful and promising. Fifteen years have elapsed since this happy prophecy was made, and I feel that this is a fit occasion to take stock and see how far the hopes held out by Mr. Ranade have been realised, though it must be confessed that for more than a decade after his declaration no serious, sustained and systematic attempts were made to further the cause of industrial development. It is during

the last five or six years that we have once more roused ourselves from our lethargy, and this Conference itself is a sign of the healthy activity we have resumed. To ensure a correct judgment in my survey, I propose to set up the same tests and the same standards for comparison as Mr. Ranade used for the purpose. Such a survey has become necessary to guide our footsteps in the right direction and to encourage us in our uphill work of industrial regeneration. It will also serve the useful purpose of dissipating the false hopes that we are always likely to form of our future and to open our eyes to the realities of the present situation as distinct from the delusive dreams of day-dreamers.

Though the ever-advancing values of imports and exports of merchandise given in the official trade returns may not be a true test of the growing prosperity of the people, they are useful as indicating how, as a result of our increasing wants and the rapid spread of railways and other means of communication, we have been consuming more goods from foreign countries and sending out to them what they want also in larger quantities.

TABLE NO. I.

Showing the increase in imports and exports during the last 14 years.

Quinquennium.	Average of imports of merchandise.	Variation taking 1892-93 as 100.	Average of exports of merchandise.	Variation taking 1892-93 as 100.
	RS.		RS.	
1893-94 to 1897-98.	70,90,02,668.	100	1,01,79,71,169.	100
1898-99 to 1902-03.	75,13,53,955.	106	1,13,25,58,571.	111
1903-04 to 1907-08.	1,04,54,99,143.	147	1,61,69,34,274.	159

From the above table it will be seen that, during the last fifteen years, while our imports have gone up by 47 p.c., our exports have exceeded by 59 p.c. I do not wish here to go into the details of this question of the balance of trade, and shall content myself with merely recording facts in connection therewith.

The classification adopted in official reports, by which articles are grouped in seven classes, certainly convenient in other ways, is not suitable for the inquiry which I have proposed to make in this paper. The distinction between purely raw materials and articles which have wholly or partly undergone human or mechanical manipulation is not clearly brought out in them. Following this mode of grouping, Mr. Ranade has considered as raw materials all those articles which are not classed as manufactured goods. Thus sugar, oils, spirits, tea, engines and mill work Mr. Ranade takes as raw materials, while they should have been included under manufactured articles for correctly estimating our industrial progress. As I have said above, however, I shall, for the present, adopt the same tests for comparison as he has done, and see what progress our industries have made during the last fifteen years.

In the year 1892-93 out of a total of 164 crores worth of exports and imports, excluding treasure and Government transactions, we imported nearly 36 crores worth of manufactured produce while we exported 85 crores of raw produce against 16 crores worth of manufactured articles. Comparing these figures with those of 1878-79, Mr. Ranade has mentioned five features of the transition referred to at the outset. The first of these which marked the fourteen years he reviewed, was that the exports of manufactured and partly manufactured goods had risen in the 14 years ending with 1893 by 211 p.c. Applying this test to the next fifteen years we find that the figure representing the exports of these goods was in 1907-08, $39\frac{1}{4}$ crores as against $16\frac{1}{2}$ crores in 1892-93, which means an increase of 139 p.c. in fifteen years, or a steady advance of nearly $9\frac{1}{4}$ p.c. per year as against the 15 p.c. yearly during the 14 years previous. This increase in the first quinquennium, 1892-93 to 1897-98, was 5 p.c. per year, in the second from 1898 to 1903 again 5 p.c., while in the last quinquennium ending in 1908 the increase was 56 p.c., that is, more than 11 p.c. annually. There could be no clearer proof of the rapid strides our industries have been making for the past few years. Secondly, while the increase in the exports of raw produce was 43 p.c. in 14 years ending in 1893, that in the next fifteen years was 59 p.c., which means nearly 4 p.c. per year as against the 5 p.c. increase in the exports of manufactured goods.

This comparatively larger increase in the exports of raw materials shows that we have not gained ground in this line and that we have not been making satisfactory progress in manufacturing our raw materials. We content ourselves with only sending out to foreign countries many items in this group which we ought to turn into finished goods in our own country. Thus oil-seeds, which represent a large portion of the entire exports of Indian produce, were sent out of this country to the value of $16\frac{3}{4}$ crores in 1907-08 as against 13 crores, the average value for the previous five years. This is an enormous loss to our country, and yet not much attention seems to have been paid to this important industry. Thirdly, while the increase of manufactured articles imported into India was 30 p.c. in the fourteen years ending in 1893, the same amounted to 93 p.c. in the next fifteen years, that is $6\frac{1}{3}$ p.c. per year. This shows that, as education is steadily spreading throughout the country, as the face of the land is being transformed by railways, telegraph and the post office, and as new habits, customs and tastes are penetrating into even the lower strata of our society, a larger number of new wants is being created among our people, to satisfy which imports of various kinds of manufactured articles have become necessary. The luxuries of the last generation have become the necessities of the present. As an illustration of this tendency, it may be mentioned that during the last five years the imports of metals and manufactures of metals have nearly doubled in value, those of carriages, &c., went up from 96 lakhs in 1905-06 to one crore and more in three years and a similar increase has taken place in the case of many other articles of manufacture such as cotton, leather, paper, glass, sugar, umbrellas, &c. Finally, the imports of raw produce which stood at $26\frac{1}{2}$ crores in 1892-93 reached in 1907-08 the large figure of 60 crores, an increase of 127 p.c. in fifteen years or nearly $8\frac{1}{2}$ p.c. per year, as against the $6\frac{1}{2}$ p.c. per year in the 14 years previous. This again is an indication of our growing industrial activity as it shows that we have been importing raw material in larger quantities to be manufactured in this country, thus giving greater employment to our labourers and larger profits to our manufacturers and merchants. All these results are summarised in the following two tables :—

TABLE No. II.*

—	1879	1892	Percentage of increase.	
			Total.	Annual.
	Rs.	Rs.		
Manufactured Imports..	25,98,65,827	36,22,31,872	.39	28
Raw Imports ...	13,75,55,837	26,38,18,431	91	65
Manufactured Exports.	5,27,80,340	16,42,47,566	211	15
Raw Exports ...	59,67,27,991	85,52,09,499	43	3

* Taken from Ranade's *Essays on Indian Economics*, p. 104.

TABLE No. III.

—	1892	1907.	Percentage of increase	
			Total	Annual.
	Rs.	Rs.		
Manufactured Imports	36,22,31,872	69,88,95,000	93	6½
Raw Imports ...	26,38,18,431	59,96,68,374	127	8½
Manufactured Exports	16,42,17,566	39,29,81,000	139	9¼
Raw Exports ...	85,52,09,499	134,12,31,335	57	3½

Fifthly, the proportion of the imports of manufactured articles to total imports, which was 65 p. c. in 1879 and fell to 57 p. c. in 1892, fell still further to 53 p. c. in 1907-08. In the same way the proportion of manufactured exports to total exports which was only 8 p. c. in 1879 and increased to 16 p. c. in 1892 has gone up to more than 22 p. c. during the last fifteen years.

What has been said above has, I hope, made it clear that, though the improvement noticed by Mr. Ranade has not been continued within the last fifteen years in the same proportion as in the fourteen years previous to 1893, the tendency towards a transition of India from a purely agricultural land into a manufacturing and commercial country marked by him, has been steadily kept up, and signs are not wanting to show that the stimulus which in the last five years our industrial activities have received, will in a generation or two of steady work, carry us on much further

towards the goal. I have already pointed out that the grouping of imported and exported goods usual in official reports, and used by Mr. Ranade, is not suitable for a correct survey of Indian industries. Though perfect accuracy in distinguishing between purely raw materials and articles which have undergone improved human skill or mechanical and scientific operation is difficult to attain, I shall attempt to make this distinction as accurate as possible so as to gauge the degree of our progress in industrial development. Thus, for convenience sake, I shall class sugar, liquors, metals, coal, tea, coffee, cigars, oil, &c. as manufactured goods because it is in connection with these articles that forward steps are being actually taken or are contemplated, and it is in the matter of these manufactures that the transitional stage of Indian industries is marked. Making the adjustments rendered necessary by this method of classification, we obtain the following results, corresponding to those given in Tables Nos. II—III.

TABLE NO. IV.

—	1892-93.	1907-08.	Percentage of increase.	
			Total.	Annual.
	Crores of Rs.	Crores of Rs.		
Manufactured Imports.	54	116	115	7.7
Raw Imports	8	14	75	5
Manufactured Exports.	26	54	107.5	7.1
Raw Exports	74	119	60.8	4

According to the new principle adopted in classifying goods in the above table, the imports of manufactured articles are higher here than those given in Table No. III. This is explained by the fact that in Table No. IV sugar, steel and iron, railway material and machinery, &c., have been understood as belonging to the manufactured goods class, while in Table No. III they were relegated to the group of raw materials. As a result of the expansion of the textile industry during the last few years, the imports of machinery and mill-work alone have advanced from 4.9 crores in 1905-06 to 6.58 crores last year, an increase of 1½ crore in two years. The increase in the imports of raw materials

as shown in Table No. IV is not as high as that in Table No. III, as many articles which are really manufactured goods have been transferred from this to their proper group. In the case of manufactured exports the increase in the Table IV is only 7 p.c. per year as against the $9\frac{1}{4}$ p. c. in Table III as tea, coffee and other small industries now included in this group did not, during the period under review, show as great an expansion as cotton and jute manufactures. The last item in the Table, that of raw exports, calls for no special remark. The proportion of manufactured exports to total exports is seen to be 31 p.c. as against the 22 p.c. mentioned before.

Thus with some variations here and there occasioned by the different method of grouping articles, we arrive at substantially the same results. The six features of a healthy change in the industrial condition of India, noticed by Mr. Ranade in 1893, are to be clearly seen in the next fifteen years also, and though our progress during this period is not as satisfactory as one would have wished, on the whole we have been gaining ground rather than losing it. The work we have to do in the industrial field is not easy. There are so many difficulties in our path, which it will take a long time to overcome. We cannot expect all at once to be able to manufacture for ourselves all those articles which we import from foreign countries, nor can we hope in the immediate future to turn all our raw produce into finished goods in our own land. It is sufficient if we keep our eye steadily on the goal we have to reach and do our best with the means at our disposal. It is necessary for this purpose that our attention should be drawn from time to time to the industrial possibilities of our country as also to our failures and achievements in the field of manufactures, so that we may shape our further course in the light of this experience. I therefore propose now to take a hurried view of the present condition of our industries and manufactures, indicating in each case the progress that may have been made during the last fifteen years.

(1) Let us take up cotton manufactures first, as the textile industry is at present the premier industry of India. There were only 58 cotton mills in the whole of this country in 1878. This number rose to 130 in 1892 and the same on the 31st March,

1908 was 224 with 65,741 looms and 57,64,346 spindles. Looms have, in the last fifteen years, increased by 150 p.c. and spindles by nearly 72 p.c. Of the spindles nearly 72 p.c. were in Bombay, 7 p.c. in Bengal and about 5 p.c. in Madras. Of the looms as many as 80 p.c. were in Bombay. It is superfluous to say that Bombay takes the lead in this industry and is largely providing the sister presidencies with the country-made cloth they require. Cotton mills employed in 1907-08 nearly $2\frac{1}{4}$ crores of hands besides one lakh of persons engaged in cotton ginning, cleaning and pressing mills, as against one crore and twenty thousand employed in the textile industry in 1892-93. The capital invested in cotton spinning and weaving concerns was approximately $17\frac{1}{4}$ crores last year, an increase of 56 p.c. in fifteen years. Seventy-one per cent. of the cotton mills are in the Bombay Presidency, the number being nearly 150 as against the 88 in 1892. The spinning of the higher counts of cotton on an increased scale is a noticeable feature of the last few years, Bombay leading the way in this respect also. The quantity of woven cotton goods, including that turned out in Indian states like Indore, Mysore, Baroda, &c., more than doubled within the last ten years. Here then is an industrial triumph of which we may with justice feel proud, and if that earnestness and that enterprise which have characterised the textile industry were extended to other planks in our platform, similar success is almost assured to us in the near future. In spite of our rapid progress in cotton manufactures, be it noted, we yet imported more than 44 crores worth of cotton fabrics in 1907-08 from foreign countries. This shows that there is infinite scope for expansion in this department, and we shall have to strive hard for many a long year to come before we become self-reliant in this matter.

(2) Next in importance to cotton manufactures, we have the jute industry, and with respect to it, Bengal occupies the same place as Bombay does in the textile industry. The number of jute mills rose from 26 with a capital of 1.68 crores in 1892 to 44 mills with a capital of 5.41 crores in 1907. The number of hands employed in these mills rose, during the same period, from 66 thousand to 166 thousand, the looms increasing from 9 to 25 thousand. The value of the exports of bags and cloth of jute nearly doubled in the last five years. This fact alone is sufficient

to show how peculiarly prosperous this industry has been of late years. It is to be noted in this connection that the exports of raw jute have not gone up in this same proportion. The exports of jute manufactures were 46.6 p.c. of the total exports of Indian manufactured goods in 1907-08.

(3) As regards woollen mills, no satisfactory progress has to be recorded. There are at present only six woollen mills, the number of the same being five in 1892. The capital invested is not more than half a crore and the number of persons engaged in the industry has gone up during the last 15 years only by a paltry 400. The two large mills, one at Cawnpore and the other at Dhariwal, claim between them 70 p.c. of the total capital invested in the woollen mills. This industry, it will be seen, affords a large opening for capital and enterprise. There appears to be considerable demand for woollen goods in this country, and it has to be satisfied with imports from abroad. The output of our mills is very small compared to the quantities imported. The value of woollen imports is six times as great as that of the Indian produce. Looking to the fact that we imported last year woollen goods worth Rs. 2¾ crores and also to the stagnant character of the industry at present, it appears to be high time that serious attempts were made to tackle this line of manufactures more earnestly. Oriental designs are being successfully imitated in rugs and carpets in foreign countries and our goods are being ousted from the market. Something must be done to maintain the reputation of this land as the home of beautiful carpets, and we must strive to hold our own successfully against foreign competition.

(4) There has been during the last fifteen years a remarkable development of tea plantations. The total area under tea cultivation was 334,825 acres in 1892-93 but this figure rose to 536,652 in 1907. The exports of tea were 120 million lbs. in weight worth 6 crores of rupees in 1892-93. Last year these figures were 227 million lbs. and 10.30 crores respectively. Though the internal demand for tea in India itself is continually on the increase, Indian tea is finding greater favour in Russia, Germany and other countries on the continent of Europe. China, the home of tea, is being gradually displaced from the English market, her contribution of tea to the same having been reduced from 50 p.c. to 5 p.c. in twenty years. The only

serious competitor with India in the tea market is Ceylon. Coffee plantations have not shown any progress during the last fifteen years, and our export of coffee is only $2\frac{1}{2}$ lakhs hundredweights valued at 1.10 crores.

(5) In another industry again, we have been marking time. The number of paper mills was 8 in 1906. The capital invested has not appreciably increased within the last many years. The paper manufactured by the comparatively older methods in India cannot be expected to compete with the cheap wood pulp paper imported from Europe. While imports of paper were valued at nearly one crore last year, the value of the Indian output did not amount to three-fourths of this figure. Much has therefore to be done in the development of this industry. It is not merely a question of capital or demand. It is a question of up-to-date methods and materials to be used in the manufacture. The problem of supplying country-made paper cannot be solved until it is approached from this standpoint.

(6) Next we come to breweries of which there were 26 in 1906 as against 21 fifteen years previously. The outturn is 56 lakhs of gallons, an increase of 8 lakhs in 15 years. More than a half of this quantity is purchased by the Government Commissariat Department, the remaining quantity being consumed by the civil population. It is estimated that two-thirds of the total production is consumed by the troops, the remaining third being drunk mostly by the European population residing in or near hill stations. The quantity of beer imported into India nearly equals that produced in the country itself.

(7) The output of Indian coal mines has been steadily advancing these many years. The quantity produced in 1892 was $25\frac{1}{2}$ lakhs of tons, while the figure for last year was 111 lakhs, an advance of 14 lakhs over 1906. To-day the total output of Indian coal is five times that of 1892. The export trade in coal has never been very active in India, and while the indigenous production is rapidly growing and the exports have never been great, the imports have been expanding year after year, which is a sure sign of industrial activity, as the imported along with the indigenous coal, is absorbed by cotton

and other mills. In 1907-08 as many as 97 lakhs of tons of coal were calculated to have been consumed in India. There are more than 300 coal mines, and over a lakh of persons employed in the coal mining industry, which is chiefly confined to Bengal which contributes more than three-fourths of the total yearly output. The iron-mining industry has also before it a hopeful prospect, and it is gratifying to note that considerable progress is being made in tapping this source of India's mineral wealth.

(8) Mysore enjoys almost a monopoly of gold mining and the value of gold extracted last year was about $3\frac{1}{4}$ crores of rupees. The Nizam's territory and Burma also contribute a small fraction of the total production, the share of Bombay and the Punjab being negligible. The gold imported into the country last year was $20\frac{3}{4}$ crores as against the 4 crores of 1892. This large quantity seems to have been hoarded or sunk in ornaments from year to year and is of no use to industrial development.

(9) In the working of iron and steel mines we are to-day where we were twenty years back. It is the enterprising firm of Tata & Sons that are the real pioneers in this industry, though the history of the attempts made so far can be traced to the early part of the last century. There are some very serious difficulties in the way of such attempts and it is owing to these difficulties that the ventures have failed. As hinted above, however, the new company of Tata & Sons are going on with their work in right earnest, and in a few years we may be able to give a good account of the industry, which requires in its organisers an amount of skill, scientific knowledge, enterprise, as also vast capital together with the active help and sympathy of Government. In the meantime our imports of the metals are going up by leaps and bounds in consequence of the rapid progress of the textile industry as also owing to the needs of railways.

(10) Kerosene oil has in recent times come to enjoy greater and greater popularity among all classes of people. In fact the vegetable oils along with the old-fashioned lamps have been swamped by mineral oils. This industry is essentially of a very recent growth, and yet within the last few years it has assumed very large proportions. As an illustration of this, it may be stated that the percentages of Indian oil and that of foreign oil

consumed in this country, which were 4'7 and 95'3, in 1898-99, became 52'9 and 47'7 respectively in 1906-07. The total quantity of petroleum produced in India was 19 million gallons in 1897 and the corresponding figure for 1906 was 140½ millions. This is a splendid record and ought to gladden the heart of every Indian patriot. Last year we imported from foreign countries 2½ crores worth of kerosene oil while the imports coastwise from Burma amounted to 2¼ crores. Our chief foreign suppliers are the United States and Russia, and in India itself the oil wells are situated for the most part in Burma and Assam.

(11) Besides the industries noticed above, there are others, smaller but not less important therefore, which await development. There is every year a growing demand for refined sugar which cannot be supplied by the Indian article. With a few exceptions sugar manufactories are not carried on on a large scale, and the indigenous article turned out in small quantities is not able to cope with the cheaper but finer product of Mauritius, Java, Germany and Austria-Hungary. In the case of the sugar industry we have actually lost ground. Our country, which at one time exported large quantities of cane sugar to other countries, now imports both cane and beet sugar of the value of about 8 or 9 crores per year. On account of our old world manures and antique methods of growing and crushing cane we are to-day far behind all other cane-growing countries in average outturn. This shows the urgent necessity of reform in our methods of agriculture and so long as we neglect this reform, it is not possible for us to compete with the cheap product of other countries. Here only capital, scientific knowledge and enterprise will not do. The help of Government is essential, and that help will be cheerfully given if asked, say, by an agricultural association on behalf of the poor and ignorant agriculturist who must be taught the use of the new methods and manures.

(12) As regards glassware we have to import almost everything we want in this line from outside, our imports of the same last year being valued at 1½ crores. This item on the import side, therefore, opens a large field before us. Last year we imported Rs. 61.2 lakhs worth of tobacco, cigarettes, &c. We have a few cigarette factories here and there, and some new ones have been very recently opened, but we have not yet been able to turn

out articles that will compete with those imported from the United Kingdom, America or Egypt. Then there are other concerns of minor importance and smaller dimensions which I shall not deal with in detail. Thus we have silk filatures and silk mills, which have shown no progress during the last many years. Attempts have of late been made—and in places they have been successful attempts—to start soap factories and match factories, candle factories and button manufactories, metal factories and cutleries, but they are too small and of too recent growth to allow a correct estimate as regards the capital sunk in them and the product turned out by them.

I have here passed under brief review the chief industries of India and have remarked on their present condition. The general impression left on the mind after a study of all the facts and figures given above, is that while we have been making, during the past twenty years, very gratifying progress in the manufacture of cotton and jute, in the working of coal and gold mines, in tea plantations and in the kerosene industry, we have been marking time as regards sugar refining, oil pressing, iron mining, paper making, wool and silk manufacturing; and in the matter of glass, leather, umbrellas, metal manufactures, stationery, carriages, etc., we are almost nowhere. It is in the direction of these that we have now to make our way. That India yet remains a large field for producing raw materials for foreign manufacturing countries is no doubt true. But the opposite tendency which commenced thirty years ago is gradually gaining strength, and during the last five years the industrial problem has become the predominant factor in the public activities of the day. The question of the development of indigenous industries is now taken up in right earnest by the educated classes, and the whole country is ringing with the cry of *Swadeshi*. It is satisfactory to find that Government have also turned their serious attention to the subject, and their sympathy and co-operation have been liberally vouchsafed to us. On the whole, though the goal is yet far off, we are to-day much nearer to it than we were fifteen years ago. Whether we look at the number of mills and factories, or at the amount of capital sunk in the industries, or the number of hands employed in them or at the spread of scientific and technical knowledge, or at the demand for Indian goods, or the

interest taken by the people at large in matters industrial, from whatever point of view we look at it, we arrive at the same conclusion, *viz.*, that we are making fair progress in the path of industrial development, and that we need not be disheartened by a few failures which are inevitable in the beginning. In describing the present condition of the various industries, I have already pointed out where there is scope for expansion and enterprise and where there are openings for capital. I shall therefore content myself with quoting a very instructive paragraph from the small but useful book on *British India and its Trade* by Mr. H. J. Tozer, as it very tersely summarises our industrial position and points out what we must do in order to improve it. 'The cotton and jute manufactures, already conducted on a large scale offer scope for still further development. Sugar and tobacco are produced in large quantities, but both require the application of the latest scientific processes of cultivation and manufacture. Oil seeds might be crushed in India instead of being exported while cotton seeds, as yet imperfectly utilized, can be turned to good account. Hides and skins, now largely exported raw, might be more largely tanned and dressed in India. Again, the woollen and silken fabrics manufactured in India are mostly coarse fabrics and there is scope for the production of finer goods. Although railways make their own rolling stock they have to import wheels and axles, tyres and other iron work. At present steel is manufactured on a very small scale, and the number of iron foundries and machine shops, although increasing, is capable of greater expansion. Machinery and machine tools have for the most part to be imported. Millions of agriculturists and artisans use rude tools which might be replaced by similar articles that are more durable and of better make. Improved oil presses and handlooms should find a profitable market. Paper-mills and flour-mills might be established in greater numbers. There are openings also for the manufacture of sewing machines, fire-works, rope, boots and shoes, saddlery, harness, clocks, watches, aniline and alizarine dyes, electrical appliances, glass and glassware, tea chests, gloves, rice, starch, matches, lamps, candles, soap, linen, hardware and cutlery.'

THE EDUCATION OF PERSONS WHO INTEND TO MAKE SCIENTIFIC INVESTIGATION TO TAKE PART IN INDUSTRIAL DEVELOPMENT.

BY DR MORRIS W. TRAVERS, F.R.S.,

*Director and Professor of Chemistry, Indian Institute of Science,
Bangalore.*

It may be assumed that in India as in Europe and America there are two classes of men, and two classes only, who may be educated or trained with a view to their employment in industrial concerns. First of all there are those who will become owners or managers of works, and secondly there are the workmen, who may rise to be works foremen, but who, except in rare instances, are not likely to rise to higher positions. It is true that many of the greatest captains of industry have risen from the ranks; but such men have possessed genius, and for genius it is unnecessary or even impossible to legislate. For the purposes of discussion at the Ootacamund Conference, I defined the education of the masters and managers and the training of the workmen as 'technical education' and 'industrial training' respectively, and pointed out that the former was the work of university institutions and the latter of trade schools. The two branches are distinct in their methods and objects, but there are unfortunately many institutions which attempt to take a middle course, and produce men who have neither acquired the manual skill of the high class workman nor the scientific, technical, and commercial knowledge which is indispensable to the manager or owner of a works. I do not propose to say anything about the training of the workman beyond reiterating the opinion that it is necessary to provide him with general education, training in drawing, etc., and in the use of modern tools and appliances, and will confine my remarks to the education of those on whom the development of industries really depends.

I have first some criticisms to make on the subject of Indian education in general. It may be assumed that in India as in the West, the average individual who intends to follow an industrial career will pass through the ordinary school course, and at the age of seventeen will pass either a matriculation or school-leaving examination such as will admit him to the University or higher

technical school. In order to point to what is wanted, I must now undertake the invidious task of making comparisons, and point out that while at the Matriculation stage the Western student has generally some knowledge of the outlines of one or two European languages in addition to his mother tongue, the Indian student may be well acquainted with English, but he is often able to carry on conversation in that language only with difficulty, and he has no knowledge of other European languages. I may point out that in respect to the language difficulty, the Indian student is at no greater disadvantage than students from such smaller European countries as Holland, Norway and Sweden. As the knowledge of the languages of those countries hardly extends beyond their borders, and the languages are practically useless for commercial purposes and for the exchange of scientific ideas; modern European languages are thoroughly well taught in the schools, and educated men have usually acquired more than a working knowledge of more than one language besides their mother tongue before leaving school. As a first step towards success in an industrial career, an Indian student should acquire a thorough knowledge of English, and if possible a working acquaintance with French or German, preferably with the latter.

I may next point out that such science as a Western boy acquires at school is usually of a practical and genuine nature, but on the other hand, though the Indian University regulations usually oblige a candidate for matriculation to pass in some branch of science, it is usually the case that this merely means that he has to read such a book as 'Roscoe's Chemistry Primer,' and has had no opportunity of witnessing the experiments described in it. Such knowledge is worse than useless; for not only does the student acquire an altogether false impression of science, but he learns that 'cram' is the road to success in examinations. The time occupied in such work were better devoted to English, mathematics or subjects in which genuine instruction can be given.

I will next consider the position of the Western and the Eastern student four years after matriculation. The former has followed an honours course, let us say in Chemistry, and during the first two years has also read physics and mathematics. He has studied his subject from the theoretical and practical stand-

point ; during the latter part of his course the greater part of his time has been spent in the laboratory, and he is qualified to undertake research under the direction of some member of the staff of the institution. He has probably also found time to gain some knowledge of workshop practice. The Indian student will have passed the 'F. A.' and the 'Intermediate' and either the B.A. or the B.Sc., but sad to relate, his knowledge of the theoretical side of any branch of science will be about equivalent to that which his Western confrère should attain one and a half years after matriculation, and in the majority of cases he will hardly have done any practical work at all.

Before considering details it will be interesting to enquire into the reasons for the backwardness of the Indian student in general. No doubt an altogether unnecessary amount of time is taken up in working for and passing examinations. Further when one has subtracted from the number of days in the year remaining over from examinations, Sundays, holidays, and vacations, it appears that remarkably little time is left for study, and considering that the working hours in India are shorter than in England it follows that the time which the Indian student devotes to the acquisition of knowledge is very much less than that occupied by his Western confrère in actual work. It is generally acknowledged that the numerous scattered holidays are of no real advantage either to students or to teachers. No doubt the hours of work in the large cities of India are already such as to try both students and teachers to the utmost ; but if this is the case it points to the impossibility of carrying on advanced teaching and research under adverse climatic conditions, and furnishes an unanswerable argument in support of the removal of institutions devoted to higher educational work to localities possessing favourable climates. It is perfectly useless to pretend that a student who is able to get through less than half the work which he could accomplish in a favourable climate can compete with a man who has worked under European conditions. I may add that the removal of students to a healthy climate during their college course would be greatly to their benefit, both morally and physically.

While I am still at the critical stage of the discussion, I may point out that it is of importance that the would be leader of industry should either possess capital, or should be connected with

those interested in industrial undertakings. In Europe or America a man without business connections can often enter a works in a subordinate capacity, and ultimately rise to be manager or even to be a partner in the concern. In India there are few such openings. Further, a man must be in a position to set aside caste prejudices, must be ready to undertake rough work, and to work at all hours and under all conditions, irrespective of any agreement which he may look upon as defining and circumscribing his duties. Finally, may I point out that the success of men who start industrial undertakings, or accept appointments, in the West often depends upon their capability to support themselves upon limited means, and to await developments. The man who at the age of twenty-two has already the cares of a family upon his shoulders is not the man to win success in industrial life.

I will now attempt to add a few practical remarks with regard to the kind of training which is suitable to those who intend to enter upon an industrial career. In the first place as I have already pointed out it is important that the student should have connections, who can help him by affording him opportunity of applying the knowledge which he may acquire in the course of his training. It would be to his great advantage if during the vacations he were enabled to gain some experience in the business side of the undertaking to which he would afterwards be attached; for the business instinct is most easily acquired at an early age, and on business capacity success largely depends. I must also insist on a knowledge of English, and it would be to the student's advantage if at an early stage in his career he were to take in, and read, one of the leading English journals dealing with the industry in which he happened to be interested. From the outset he must set himself to work with a definite object in view, and to disregard the advantages which the public services offer through the channel of University examinations, with which he need have no concern.

Arrangements should be made to permit students of this type to enter on a course of study suitable to their requirements. Suppose that a student intends to become attached to the tanning, dyeing, or oil industries, it is necessary that he should acquire a knowledge of chemistry and the allied sciences, and of mechanical engineering; indeed this combination of studies would form a

suitable course to any one intending to attach himself to any of the commoner Indian industries. He would study chemistry, physics and mathematics during the first two years at college, together with English, which should be taught from the practical standpoint. Laboratory work should be made an important feature of the course. During the latter two years he should devote himself mainly to chemistry, attending courses of instruction in machine drawing and strength of materials. He might then proceed to specialise at the Indian Institute of Science, taking advanced courses in pure and applied science, and fitting himself to cope with the problems of the branch of industry which he intends to make his life-study.

THE EDUCATION OF ENGINEERS IN THE BOMBAY PRESIDENCY.

By MAJOR W. V. SCUDAMORE, R. E.,

Principal, College of Science, Poona.

India with its roads, railways and irrigation systems stands in need of the services of large numbers of Civil Engineers, as opposed to men who have specialised in Mechanical or Electrical Engineering. It will therefore be well to consider at the outset the position of the Civil Engineer when he enters his profession in India. He finds himself in a very different situation from that which his confrere in a Western country occupies. In India, as compared with, say England, the tracts of country over which administrative and executive Engineering functions have to be performed are so vast, that the budding Engineer finds himself, at an early stage, saddled with grave responsibilities; he also has to learn to exercise, to a most peculiar extent, the faculty of self-reliance. In a country like England the young Engineer finds advice near at hand, and assuming him to be placed in charge of large works, he can make out what here is known as a 'band-obast' with comparative ease, for the reason that he has many markets from which he can draw his supply of materials required in construction.

In India the case is very different. Here the Engineer has very often to be contractor and engineer rolled into one. His duties may be of the most varied and strenuous nature; he has

to search for his own materials, burn his own bricks and lime and determine experimentally the suitability and the proportions of his materials. To be a success, he must possess tact, self-reliance, honourable and gentlemanly feeling ; his physique should be good and he must be able to endure fatigue and exposure. In addition, his professional knowledge must be adequate, and he must never lose sight of the fact that his Engineering education ends on the day on which he finally gives up the practice of his profession.

It may reasonably be assumed that the qualifications just specified cannot be entirely attained in a course of instruction in a College, but the teaching staff, if efficient and competent, will not fail to bear in mind, from start to finish, the object of the training they are giving ; and during a young man's College career numerous opportunities do unquestionably arise, when modified responsibility can be placed on the shoulders of students, and when their moral characters can be influenced in a healthy manner.

To give an illustration of one direction in which the student may advantageously be encouraged to teach—those who have had anything to do with teaching in India are well aware of the too common practice of learning by heart. In the subject of Engineering and the Sciences on the application of which the subject depends, there is ample scope for fighting against this deleterious practice, because the student can be compelled to attempt to give a real proof of a problem by making with his own hands a series of measurements or experiments, the results of which will go a long way towards convincing him of the truth of any law that has been theoretically demonstrated to him.

One weak spot in the present system of education in the Bombay Presidency seems to be that, as far as Engineering is concerned, too great importance is attached to the results of the University examinations. The Indian student is very quick in seeing what subjects pay, *i.e.*, he works at things which he knows will save him marks. The effect of this is that much valuable time is wasted, which might well be devoted to the study of more important subjects. The remedy for this weakness is not far to seek, but it is difficult to persuade the ruling body of the Uni-

versity that it is a real one. With due deference it is held that the work actually done by students during their College course, should be allowed to count towards the scoring of marks at the end of a session. In Engineering it is essential that a student's knowledge of certain things should be tested by a practical examination; with a large number of candidates offering a subject, it is more than likely that such an examination cannot be carried out thoroughly, the time factor being such a pressing consideration. A carefully kept set of laboratory notes can, however, be minutely scrutinised from time to time by the College staff, and the merits of a student can, it is thought, be appraised with far greater accuracy than by the less searching system now in vogue.

It is treading on somewhat delicate ground when the pecuniary position of University candidates is considered, but the point has an important bearing on the further development of Engineering education. As things are, the fees leviable are, without doubt modest enough to place the course of instruction within the means of a very large and varied class. How far this is desirable is open to question. Consider the case of a man drawing Rs. 30, as a clerk, who is blessed with a son who has the gift of passing examinations. By exercising a rigid economy he can possibly afford to send his son to College, and if all goes well, his laudable desire to place his offspring in a sound profession, meets with the success it deserves; but let sickness or other misfortunes intervene, and the tale is a very different one. The course cannot be finished and the nett result is a young man with a smattering of knowledge incompletely digested, and with a natural feeling of disappointment and discontent. It appears that some sort of differentiation is required in the kind of education that is to be afforded; whether this can be done by Honours Classes or by complete separation of classes can only be decided after a careful and exhaustive consideration of a difficult subject.

A striking point in connection with the subject under review is that it never seems to have been brought home to the minds of the general public that the profession of Engineering is deserving of any public support in the way of financial aid by the well-to-do classes resident within the limits of the Bombay Presidency. With one notable exception, it may be fairly stated that no such

aid has been forthcoming, and had it not been for the generosity of the late Sir C. Jehangir, even this one exception would not have required mention. This state of affairs is in very marked contrast to the conditions obtaining in the United Kingdom, where instances of substantial donations and endowments from private sources are exceedingly common in the Universities and other institutions where Engineering forms an important part of the course of instruction. It may probably be safe to attribute the attitude of the large class of wealthy inhabitants of the city of Bombay in this respect to the fact that custom has sanctioned the idea that it is the business of a benevolent Government to provide the whole of the means necessary for the instruction of the Indian youth in this subject.

It is now expedient to mention the various public bodies who are interested in securing the services of a trained Engineer.

In the first place there is the Government Public Work Department in which men are required for Railways, Irrigation and Roads and Buildings ; then we have Municipalities large and small, Port Trusts, Improvement Trusts, Local Boards, private firms, and lastly, contractors. Stress may well be laid on this last class. In a country like India, it is of the most distinct advantage to the whole community that large public works should be carried out by reliable firms of contractors and the head of such a firm ought to be a qualified engineer.

Now let us see the provision that exists for training men for the work they have to do under the numerous bodies mentioned. It is the opinion of many Engineers that railway men should be trained on railways, and that the college-trained man is not a satisfactory product. Similarly large private firms may prefer the man who has risen from the ranks through a practical course of work in their own shops. To the writer this appears to be a small minded and erroneous view to take, and a comparison with other countries might well satisfy the most sceptical that there is a real need for a sound theoretical college training in Engineering.

The existing provision consists of one institution only where the higher training in Engineering can be obtained, *viz.*, the College of Science, Poona.

Bombay has its Victoria Jubilee Technical Institute ; Karachi has a small Engineering class for men seeking a subordinate position in the profession and there are various technical schools where a certain amount of engineering work is taught. But when all is said and done, the fact remains that Poona is the only place where a man who wishes to be an Engineer, can find the means of learning what he wants to.

The Poona college is affiliated to the University of Bombay, and within recent times the courses of instruction have been modified and amplified in order to bring the training more into line with modern requirements. Much remains to be done, although the proposals of Government to develop the training in Mechanical and Electrical Engineering are conceived in no niggardly spirit. Is it unfair to appeal to the public to come forward and still further assist the improvements that are being made in offering to the youth of India a moderately lucrative and decidedly honourable profession ? India is after all a country which depends on agriculture, and the art of the Engineer is essentially necessary to provide means of transport for the produce of the land and to design and construct Irrigation works to help on the agricultural operations. As far as Mechanical and Electrical Engineering are concerned it is only necessary to point to the growing mill industry and to numerous lighting and power schemes. Surely a sound training in these subjects must be needed by many young men who mean to help on the industrial development of their country.

To consider now the question of Mining Engineering. It is common knowledge that Industrial schemes of mining are being initiated on a large scale. The Bombay-bred youth must, as things stand at present, travel to Calcutta if he wishes to learn about Mining. Time alone can show if this is always to be the case, but when clever heads are put together to consider the industrial development of India, this certainly seems to be a matter over which a pause may be made, and enthusiasts may make an effort to take some step towards the inauguration of a 'school of mines' under the ægis of the Poona College of Science.

Architecture is at the time of writing, left hopelessly in the cold. This cannot be right in a country with the traditions of

Agra, Delhi, Ahmedabad, Bijapur, etc. It is perhaps only right to say that the teaching of Architecture must be kept rigidly apart from that of Engineering, but now a man studies the latter and thinks he can style himself architect. It will be a fortunate thing for the amenities of life when the mind of such a man can be disabused of these ideas.

Another subject which deserves attention is that of Chemical Engineering. This is of comparatively recent growth, but in western countries is now receiving very marked attention.

To sum up the chief requirements of the situation we have to consider the following points :—

(a) Co-operation by employers of engineers ;

(b) A display of more public spirit by the well-to-do classes in affording financial aid.

With regard to (a) it is an axiom that theoretical training alone is not of the very first value unless it can be supplemented by a practical training. Efforts are being made at Poona to render the instruction practical but a comprehensive scheme to ensure the Sandwich system of practice and theory is eminently desirable. With this end in view, the co-operation of working bodies and firms is a *sine qua non*.

As to (b) it may perhaps be remarked that undue stress has been laid on this point, but the writer is convinced that the industrial salvation of this country lies in the word 'self-help' and that it is to the very material interest of those who have this salvation in view, that they should leave no stone unturned in order to try and bring pressure on those of their countrymen, who are in a position to forward by financial assistance the interests of the whole community, and to assist in the establishment of a thoroughly efficient, up-to-date and self-contained institution for the training of Engineers, with the present College of Science, Poona, as its nucleus.

AGRICULTURAL INDEBTEDNESS.

BY LALUBHAI SAMALDAS, ESQ., BOMBAY.

One of the subjects brought forward for discussion at the last Simla Conference of Registrars of Co-operative Credit Societies was that of affording relief to indebted agriculturists. After showing the necessity of affording such relief and referring to the present law on the subject Mr. Gourlay submitted the following proposals:—

1. This Conference suggests that the Government of India should take up the consideration of a Bill for the Relief of Agricultural Indebtedness, &c.

2. If, however, the Government of India are not satisfied of the urgent necessity for such an act, this Conference suggests that an inquiry should be instituted in the larger Provinces as to the necessity for affording relief to indebted agriculturists by the passing of such an Act.

Unfortunately the Registrars were not prepared even to discuss this important question and they resolved to postpone the consideration thereof for one year which time, they thought, would suffice for its study.

This paper is written with the object of having the question discussed from a non-official standpoint, so that it may prove of some use to the Registrars when the matter is brought up before them at the next Conference.

The main points that require to be considered in connection with the question are—

- (i) Are the agriculturists so very much indebted that it is necessary to treat their case as a special one?
- (ii) If the first question is answered in the affirmative, is it better to tackle the problem either by legislation and executive orders, or by means of arbitration and the exercise of moral pressure?

- (iii) The methods of finding funds for paying off to the creditors the amount settled according to the procedure that may be adopted with reference to II.
- (iv) Whether the agriculturists should have the liberty to run into debt after the existing debts have been liquidated.

With reference to (i), there is a large consensus of opinion—both official and non-official—that the agriculturists of the country as a whole are so hopelessly involved that some measures of relief are absolutely necessary. At the last Conference of co-operative specialists held in Bombay, H. E. Sir George Clarke referred to the indebtedness of the agriculturists of the Western Presidency in the following terms: 'I will only say that one of the very saddest features in the life of our Presidency is the heavy and, I fear, growing indebtedness of the cultivators.' Opinion is divided as to the causes which have led to this heavy and growing indebtedness. There are not a few non-officials who attribute it largely to the heavy land revenue assessment which being increased, they say, at revision settlements has landed the cultivators in debt. There are many officials and some non-officials who think that the absence of thrift and the large expenditure at social functions are the chief causes of such indebtedness, while there are others who form a vast majority of officials and non-officials who think that it is the high rate of interest that the sowcars exact from the cultivators and the gross ignorance of the latter which enables the money-lender to get any terms agreed to by the cultivator, that are mainly responsible for their present depressed condition. Possibly these three causes combine in varying proportions to bring about the above result. It has still to be proved by facts and figures that the incidence of the land assessment is so very high that it actually forces the cultivator into the hands of the money-lender. It is not easy to say to what extent the imprudent habits and customs of the

cultivator, have led them into indebtedness ; it will, however, take very long before they are cured of these habits, by the spread of education and correct notions about their social responsibilities. On the other hand the success achieved by the newly started co-operative societies in reducing the heavy rates of interest, proves that the indebtedness is largely due to the sowcar's methods of doing business, and also that it is possible to reduce the cultivator's indebtedness by freeing them from the clutches of the present money-lenders and providing them with the means of borrowing money at a fair rate of interest whenever they want it. The needs and ignorance of the agriculturists on the one hand, and the greed of the sowcars and their capacity to take full advantage of their circumstances, on the other, make it absolutely necessary that Government should tackle the problem as early as possible.

2. Attempts have been made in Bombay and the Central Provinces to solve the problem by legislation and executive acts. An Act was passed in 1879 in the former Presidency called the Deccan Agriculturists' Relief Act whose preamble says 'Whereas it is expedient to relieve the agricultural classes in certain parts of the Deccan from indebtedness, it is hereby enacted, &c.' The Act lays down the procedure to be adopted in suits where agriculturists are parties. It gives the court power to investigate into the history of transactions with agriculturist-debtors and prescribes the mode of taking accounts. After the Act had been in force for some twelve years a commission was appointed to inquire into its working. The Commission in its Report says : 'It was anticipated by the framers of the Act that its provisions would check unsound credit, this expectation has to a large extent been realized, but the commission has failed to obtain any satisfactory proof that the credit of the solvent ryots has suffered in any way.' The Report goes on to say 'The Act has not checked, and was never expected to entirely check extravagance and improvidence' and then adds, 'In all districts

there is a considerable amount of evidence to show that thrift and enterprise have been fostered and not discouraged.' The Commission was not able to find out the exact proportion of the reduction of old debts in suits instituted under this Act, but it says: 'In addition to the reduction effected by direct action of the courts under the Act, a considerable and probably very large reduction was indirectly effected by—

(a) creditors themselves who in many cases framed their claims with reference to the provisions of the Act ;

(b) by means of agreements arrived at before a conciliator ;

(c) by private settlements.'

As the Act can be enforced when an agriculturist comes to the court to take advantage of it or in cases where he is dragged into court by his creditor, and as he has no other agency to finance him and may thus be obliged to go back in times of emergency to his old sowcar, he is naturally unwilling to seek the assistance of the court until the exactions of the sowcar have become unbearable. The passing of a similar Act for all the provinces will not therefore suffice for the solution of the problem in hand.

In the Central Provinces, at the time of asking special assistance in 1898 the Commissioner suggested that one of the conditions of advancing takavi to a ryot in Khurai Tahsil and Dhamani Paragana of the Saugor district should be 'that the Malguzar should give him a full acquittance of all debts due from him and that if he owes to a *Baniā* not being a Malguzar the *Baniā* should remit 12 annas in the rupee.' The Commissioner added, 'These lines may seem hard, but from what I learnt they will be accepted without much hesitation'. This is not difficult of comprehension when it is added that 'the debts outstanding are, in fact, almost wholly irrecoverable.' This is an exceptional case and cannot be followed as a precedent,

In 1899 the Chief Commissioner issued orders on the subject of granting remission of revenue on account of agricultural deterioration which had followed the famine. It was laid down that every effort was to be made to induce the Malguzars to remit a portion of the rent due on account of the previous years in connection with the relief granted by the Government. The Divisional Commissioner acting upon this general authority instituted proceedings for the reduction of debts in Damoh District. The operations were conducted entirely by non-officials, each group working under the general guidance of an official. They were chosen for their respectability and local influence, and it is acknowledged that without their assistance as conciliators the officials would not have been able to effect anything. About 85 p. c. of the creditors of tenants whose debts were settled belonged to land-owning classes, while only 15 p. c. belonged to the purely money-lending classes holding no land. As these conditions do not occur in the whole of the country, the above procedure also cannot be successfully adopted in the other provinces.

A combination of both these methods, *i.e.*, legislation on the lines of the Deccan Agriculturists' Relief Act but making it compulsory in certain selected tracts, and leaving the work of settlement of the amount of debts in the hands of non-official conciliators as in the Central Provinces, is likely to prove a successful solution of the problem. Great care will have to be taken in carrying out the first few experiments so that the decision of the conciliators is just to the money-lender as well as merciful to the ryot. If these experiments are carried out in such a manner as to relieve the indebtedness of the agriculturist without exciting the active opposition of the money-lending classes the problem will be more than half solved. For in such matters, fashion counts for a great deal and as successful operations spread, the suspicion of the money-lender will be changed to acquiescence and acquiescence to an apprehension, lest he should be left out of the scheme. 'Moreover,' as the

Chief Commissioner of the Central Provinces aptly says, 'the money-lender as a class is not the insatiable horse-leech he is often represented to be, and if he is approached in a reasonable manner and through his own people and if he is being treated with equity and consideration, he is ready to recognize the force of facts and deal with his debtors reasonably and even liberally.'

3. Unless there is some agency ready to advance to the agriculturists the amount which has been determined to pay to their creditors the only possible way is to make the amount payable by instalments on such terms as to payment as the conciliator thinks fit. Moreover in the case of a mortgagee with possession he would most probably have to be left in possession of as much property as will enable him to recover the amount with or without interest as may be decreed. Under this arrangement the agriculturists will be forced to have dealings with the same class of persons, and there is a probability that things will again begin to move in the old groove and that before long the original state of things will re-appear, which will be tantamount to the undoing of the conciliator's work. A large central bank such as was suggested at the Simla Conference with powers to deal both with Co-operative Credit Societies and with individuals will be in a position to advance to the agriculturists the amount settled to be paid to the existing creditors. In villages where the Co-operative Credit Societies exist the money will be advanced to the societies and the societies will be responsible to the bank for its repayment. But where no such societies exist and where it is not possible to start them before the time of the award of the conciliators, the Bank will deal directly with agriculturists and will have a first lien on their lands—as much as would leave a profit equal to the interest plus about one-tenth of the amount advanced. Two objections are likely to be raised to this proposal. It may be said that if the bank is allowed to deal directly with the agriculturists it will tend to check the progress of

the co-operative movement. If the bank is not allowed to advance to the agriculturists at a lower rate than what the societies charge from the members there is every reason to believe that the bank will prefer as securities the unlimited liability of the members of a co-operative society to the individual credit of an agriculturist, and consequently the greater part of the bank's dealings will be with such societies in preference to individual agriculturists. It will not then interfere in any way with the progress of the co-operative movement. The reason why the proposed bank wants to have powers to deal with individual agriculturists is that it may happen that in certain villages the agriculturists may not be able to form a co-operative society for reasons beyond their control and to exclude them from the operation of the proposed Act would be hard on them. The other objection that may also be raised is that sufficient Indian capital will not be forthcoming to liquidate the existing debts of the agriculturists of the whole country, and that it is not advisable to undertake this work with foreign capital. In the first place it is not proposed to take up this work for the whole country all at once, and secondly the sowcars who are paid off must find some investment for their money and there is a probability of its coming back to the bank and through it to the agriculturists. At present local capital suffices to finance the agricultural industry of the country ; there is no reason why it should not be able to do the same work only because it is proposed to undertake it on a reformed plan.

4. It is said that no scheme for liquidating the agriculturist's debts is likely to be successful so long as he has the power to borrow to any extent on the security of his lands, and that the restriction of his right of alienating his lands should be a concomitant of such a scheme. Granting that there is some force in this argument, I do not see the advisability of the ryot's right being restricted in connection with the scheme for liquidating his debts. The motives of the Government are likely to be misunderstood or

misrepresented in bringing forward both these measures together. While the first measure may lead to the opposition of the money-lending class the second will be resented by the ryots as an encroachment on their rights, and it is not a wise policy to make both these classes discontented, and the apathetic attitude which is likely to be adopted by the agriculturists will tend to wreck the scheme. Moreover it will not be necessary to adopt measures respecting the ryot's right of alienating his lands if the work of liquidation is carried mainly through the agency of Co-operative Credit Societies, or in some cases through the agency of a Central Bank, as the societies are sure to keep an eye on the dealings of their members and not allow them to borrow unnecessarily. In cases where the dealings are with a central bank, that bank will have a prior lien on the agriculturists' holdings and consequently no money-lender will have large dealings with them on their personal security. There is another reason for not having recourse to any measure respecting the ryot's right of alienation. After lightening the burden of his debts it is necessary to give him at least one chance of proving that he is not the imprudent thriftless depraved individual that he is usually represented to be. At present he has no clear idea of his financial position, and believing that he can never be free from debt he has grown reckless. Once he understands his position and knows that he has a chance of establishing his economic independence he will most probably not fail to take advantage of the circumstances. Now that local Governments are adopting measures tending to improve the condition of the agriculturists, is it too much to hope that measures for relieving agricultural indebtedness will form one of these?

AN INTRODUCTION TO CO-OPERATIVE CREDIT.

BY H. R. CROSTHWAITE, ESQ., I.C.S.,

Settlement Officer, Jubbulpore.

MR. PRESIDENT AND GENTLEMEN,

You have been kind enough to ask me to send you a paper on the subject of co-operative credit, and, while I am glad to be able to comply with your request, I must state at once that I am not vain enough to pose as an expert in a matter so vast as the science of humanity. For it is that science, gentlemen, with its myriad intricacies, which affords a foundation for the edifice which the votaries of co-operation and co-operative credit are attempting to build, not only in India but in many other parts of the world. 'True economy' wrote John Ruskin, 'means spending or saving money, time, or anything else to the best advantage.' Co-operative credit is a science of economics in the very widest sense in which that term is applicable, for it involves the best use of many of the finest qualities of human nature, and the avoidance of waste of qualities which can only be productive when they are insured by those conditions of internal peace and order which highly civilized countries and Governments exhibit. To all, save those who cannot or who will not see, the fact that the co-operative credit movement is beginning to flourish in India must appear as a sign of the times.

'Adversity' wrote Lord Macaulay, of an England of internal stress and storm, 'compelled men to combine. Prosperity,' added the same historian, meaning to describe an England of peace and growing commerce, 'encouraged them to separate.' Combination for the purpose of protecting life and property in a country the commercial progress of which has been brought to a standstill by internecine warfare is followed, as soon as conditions favour trade, by the separation of individuals intent on reaping the fruits of their own industry. And history has repeatedly shown us that

the next step is the congestion which follows unrestrained competition ; capital has become concentrated in the hands of a comparatively few of the more successful in the struggle for existence, and millions, who could take part in the struggle with reasonable prospects of success, had they only the use of capital, are left to miss their opportunities and waste their energy. Those who have capital are willing to lend it but at a price which leaves no profit to the borrower who employs it ; and the consequence is that, as it is the hope of reward which sweetens all labour, encouragement to industry is to be found only in the impulse to obtain the bare necessities of life.

A comparison of peoples and communities proves that the prevailing standard of comfort is in proportion to the degree of industry ; and when capital absorbs an unduly large proportion of the profits of labour it contributes towards a demoralisation which involves a thriftless and sordid existence the pleasures of which are confined to the satisfaction of the animal appetites while the only luxury enjoyed is the rest that separates the periods of toil. The history of nations and their development shows a stage at which the abuse of capital by those who have amassed it produces serious evils which, in their turn, lead to the adoption of more enlightened methods of finance. It has been proved on more than one occasion that it is suicidal policy to kill the goose that lays the golden eggs of a country's prosperity.

Now take a step further with me in my argument. Given the necessary conditions of peace the prosperity of any country must depend on the industry of the people who inhabit it.

Nobody, however, will be industrious without sufficient inducement. The cultivator, for instance, is not likely to spend much time and trouble on a field the produce of which is likely to be carried off by marauders : nor will he take great pains to produce a bumper outturn for the

benefit of the money-lender whose slave he has become. 'My share' he will reflect 'will be the same whether the harvest be good or bad. Enough to support life on and no more.' And if the country in which the man making this reflection lives is an agricultural one and if there be many other cultivators in that country of the same way of thinking, then, gentlemen, the spirit of industry in that country is in danger of extinction; and, as we have assumed the country to be an agricultural one, the prosperity of its peoples is in jeopardy.

Now let us suppose—and I am sure that most of you know whether the supposition is correct or not—that the prevalent methods of Indian village management and Indian village finance tend to place an unduly large share of power and of the produce of the soil in the hands of the *mahajan* to the detriment of the vigour, industry, and independence of the cultivating classes. If the supposition be a correct one we, in India, are face to face with a very serious economic problem. We cannot place the cultivator behind a rampart of artificial legislation and declare that he shall not deliver most of his produce to the money-lender. Even if we could, such measures would be useless. Nor will the other resources of India, however much they may be developed, ever render more than a small fraction of her peoples independent of the soil. How then is provision to be made for the continuance of India's prosperity? The answer is, by securing the moral and material progress of the tiller of the soil as well as of the rest of the population; and it is because the co-operative movement is likely to be a most important means of attaining this end that the Government of India have shown it favour.

'There is something about co-operative credit' writes Mr. Henry Devine, 'which induces its admirers and advocates to indulge in most high-flown language regarding its influence and effect'. This remark contains a good deal of truth, but it is also true that in these days of advertise-

ment and hustle the picture must be painted in vivid colours if it is to catch the public eye. The apathy of the average man as regards economic problems is very marked and not difficult to understand.

I do not propose employing on the present occasion any other colours than those contained in the box which is open to any of you who care to study the literature of co-operation, supplemented by some from the store of my own experience as a worker in the cause in India.

The leading principle of co-operative credit is the combination of several weak individual credits into one strong united credit, and the attraction and distribution of capital at reasonable rates of interest by means of the union of the units of which the union is composed. The units may be individuals or they may be individual societies. I shall first deal with the unions which attract and distribute capital to individuals.

The pioneer of modern personal co-operative credit—as distinguished from other forms of the same principles—was Herr Raiffeisen, whose first bank was formed in 1849, at Flammersfeld, of which he was Burgomaster.

At about the same time Herr Schulze Delitzsch, an ex-Government official of scanty means, established the first People's Bank of the large system which bears his name. The system of Raiffeisen is animated mainly by moral considerations of intense sympathy with the victims of extreme poverty, while that of Schulze Delitzsch rests upon ideas of improved economic utility. Raiffeisen Societies commend themselves to moral enthusiasts and religiously minded men, whilst Schulze Delitzsch societies secure the approbation of those who are suspicious of any mixture of philanthropy with business.

I may say at once that I have found that a middle course between the ideals of Raiffeisen and the practical but somewhat uncompromising system of Schulze Delitzsch is best

suited to those districts of the Central Provinces in which I have had the privilege of working.

Under the Indian Co-operative Credit Societies Act, societies are divided into two broad classes, rural and urban ; and it is under this Act that societies are registered. The law contemplates that the liability of the former class of society should as a rule be unlimited, that of the latter limited. In this the Indian legislature has followed the practice in England rather than that of other countries. The type of rural society which I have found most suited to this country has no share capital and unlimited liability, and it is this type of society too which appears to me to be the easiest to work in the case of urban societies formed for the combination of the credit possessed by persons of small means, such as weavers, dyers and the like. Two questions naturally suggest themselves in connection with rural societies of this kind :—

(i) How do the societies, in the absence of shares, obtain their working capital ?

(ii) Why are they formed on principles of unlimited liability, and how does it work in practice ?

The answer to the first is that they obtain advances, at as low a rate of interest as possible, from Central Urban Societies—the constitution of which I shall deal with hereafter—or from individuals, on the collective security of their members. They afford the wealthy amongst you an opportunity that you will welcome to help your poor on brotherly business lines.

The answer to the second is that most of those whom these societies are intended to benefit either cannot afford to invest in shares, or would be deterred from forming societies by being required to purchase shares, or would burden themselves with an unnecessary charge for interest on share capital which would raise the cost of loans. It is also suggested that less personal interest would be evoked

and less careful supervision result if the financial liability of members of these societies was more limited.

In rural India the doctrine of collective responsibility is already well known in connection with the system of *takavi* advances, though I am bound to say that I have found that cultivators are very chary about offering to share the responsibility of others when taking loans from Government. The reason is that as soon as recovery is ordered the cunning and dishonest have every opportunity of evading payment and seeing their debts realised from their honest brethren, for the means of recovery are prompt, and there is no time to apportion responsibility. But in the case of rural societies I have found the objection to collective responsibility disappear provided that members of the right stamp only are admitted and that the sum to be lent to any individual member is limited by the members themselves at their annual general meeting. A good definition of a rural society would be 'a mutual society formed, composed, and governed by cultivators themselves for encouraging regular saving and granting small loans on easy terms of interest and repayment.'

These societies have been well described as 'rivulets of the river of banking,' for they deal with people who are neither cared for nor catered for by large *mahajans* but are left to the tender mercies of the village moneylender with his slender capital and extortionate rates of interest.

The principal security of a member of a rural society is his character which may be supplemented if the management of the society desire, by one or two personal sureties from amongst his fellow-members. It is on mutual trust founded on intimate knowledge of personal character that the fabric of the rural society depends. The student of human nature assumes that the man who would gladly cheat the money-lender will do his utmost to repay a debt due to a society of his own class.

It is to the village that I prefer to confine my rural

society. People living in the same village generally know all about one another : whereas, in India, I have found that a man knows very little, if anything, and that generally bad, about his neighbours in adjacent villages.

The principles underlying the type of rural society I now indicate may be thus summarized :—

Small areas ; the enrolment, after careful selection, of a certain number of members of known honesty and industry ; the individual and collective liability of these persons for the necessary working capital ; no shares, or shares of merely nominal value, no division of dividends ; all profits devoted (a) to the building up of a reserve fund, and (b) after the provision of an ample reserve fund, to works of public benefit, e.g., the construction of wells, schools, or temples ; the gratuitous service of all officials.

Each rural society elects its own President and committee of management and these decide all matters subject to the powers vested in the general meeting of all the members. I mention that Raiffeisen recognized the necessity of every society including amongst its members richer persons than the average cultivator, so as to strengthen the economic security of the society and guide less educated people in methods of business management. This cannot be done always in India where our business is to do the best we can with the resources at our disposal ; but I have found *malguzars* and village school masters very efficient members of the boards of control.

Raiffeisen Societies permit the grant of loans for productive purposes only : and the principles underlying this restriction are so obvious that they might, at first sight, seem the best for adoption in India. But, as a matter of fact, no rural society in India can be a success unless it entirely fills the place which the money-lender occupies towards his clients. Loans contracted for ceremonial expenditure loom very large in the indebtedness of the Indian tenantry, and the ties of custom are so strong that the

individual has a very small say indeed in such matters as the expenditure to be incurred in the marriage of a daughter. He must spend the sum which custom, his position and his caste-fellows demand of him without regard to his financial resources. If, then, a rural society is to refuse loans except for productive purposes the money-lender is left with an effective weapon of attack in his power to refuse any of the members the money which they must find for marriages, funerals, and the like. Indeed, I now go further, and insist on the liquidation of all old debts; for I have known cases in which a hostile money-lender has put his debtors into court the moment they became members of a Co-operative Credit Society.

Loans, of course, must be granted to members only and ample time must be allowed to borrowers to make their profits out of advance or to sell the produce of their holdings before repayment. I am inclined to believe that the system of granting loans 'on honour' without the signing of any document whatever will be found to be that best suited to the peculiar temperament of the Indian peasant. I have found it the most successful.

In matters pertaining to accounts rigid simplicity should be the rule. Nothing is more vexatious and annoying than the signature of numerous forms in triplicate or entry of the same matter over and over again in a large number of registers. My rural societies maintain a *bahi khata*, a *rokha bahi*, a register of members and a minute book. Even so, some of them, although working very well in every other respect, require assistance in keeping up these simple books. As with accounts so with rules. What is required is a *minimum* of rules; not a lengthy set of rules which provide for every possible contingency however remote. We can only deal with men of character and a certain amount of sense and after sufficient preliminary instruction we should leave them to manage their own affairs in the light of the broad principles which the rules must lay down in simple language for them.

I will now describe to you the steps which I take to start a rural society of the kind which I have just outlined.

I recognize frankly that we, in India, cannot expect to abolish traditional methods of business and traditional rates of interest in a few years. No thinking man can affirm that the obsolete methods of business which prevail in rural India are the best weapons with which to fight India's competitors in the commercial struggle of 1908. But we cannot change the present weapons suddenly: and, if we could, it would take a long time to teach the use of the new ones. But what we, who are working in the cause of co-operative credit in this country, have set our minds to do is to make a start in the right direction. And we must take care that the start is not a false one.

Great discretion then is required in the selection of the proper combination of circumstances for our initial experiments. There is a class of borrowers with whom we must have nothing to do, namely, lazy, vicious or slack persons who live in an atmosphere of permanent indebtedness, are always behind in their obligations, and would sink to the same state from choice or weakness as often as they were put straight. These are the type of people responsible for the argument that it is unwise to provide cheap capital for the Indian of small means. But we are fortunate in India in the possession of millions of cultivators of wonderful integrity. It is from them that we must select the members of our rural societies; many of them are in debt and carry the burden of heavy interest. It is that burden which endangers their economic security and future well-being and renders them easy victims to the attacks of bad seasons, for it saps the reserve which they should, and doubtless would, put by to meet possible emergencies.

Now villages possess character in much the same way that men do—we know the expression a '*badmash* village.' And no one is quicker to recognize this fact than the

money-lender ; for, you will find that although two villages may be exactly alike in fertility and resources yet the inhabitants of one have to pay for their money at much higher rates of interest than the inhabitants of the other. The difference arises in the fact that the money-lender knows from experience that the people of the first village will not pay until they are absolutely compelled to—so he has to include the cost of recovery in his rate of interest,—whereas the people of the second village always make honest endeavours to discharge their debts.

Select then as the place for your society a village of good repute, the cultivators of which are men who will not rush to you merely because they think that you are going to show them how to procure any amount of money with little or no enquiry, at a low rate of interest, and with no security. Next, proceed to explain to them what co-operative credit means and mention the benefits which it will secure. These benefits do not include, as some people seem to imagine, the turning of illiterate persons into capable scholars and the production of peace and plenty out of sterile conditions as a conjuror produces all sorts of articles out of an empty hat. Nor are co-operative credit societies a panacea for poverty. But they constitute one of the many ways of improving the condition of the people and of bringing about the better distribution of wealth.

The benefits of these societies are material and moral,—economic and educative. No one who does not understand and appreciate both aspects of genuine co-operative credit is likely to make much progress with it. Co-operation which is non-moral is a misnomer. Co-operation in economic affairs which is not conducted on business lines will fail. But the business is to be brotherly business, not ordinary commercialism.

The provision of cheap capital is, by itself, likely to do harm if the wrong sort of people are allowed to avail

themselves of it. Insist strongly then on the point that the character of the society will depend on the character of its individual members and invite all who have been listening to your harangue to join in the rejection of candidates whose character and reputation will not bear scrutiny. You will find it hard and frequently disheartening work—preaching the gospel of co-operative credit. I have talked for hours to apparently intelligent people who assured me that they understood my meaning very well, and who did understand very well, only to find that there was no brotherly feeling or confidence amongst them. They were each man for himself and none for all. Make sure that your society will include one or two members of good practical ability and explain to your audience the fact that the members will control the management of their own affairs by men elected by themselves from amongst themselves and that the business will not be managed for them by Government or anybody else. For it is in this that the educative influence of the movement largely consists.

Go over your proposed rules for the conduct of the society and insist on discussion. I have submitted with this paper a set of simple rules* which I have adopted in the case of my later rural societies. They are the result of a process of elimination and of practical experience, and while I do not pretend that they cannot be improved upon I do urge that the fewer rules you have the better, provided you secure the observance of essential principles. Next point out the importance of letting no member borrow more money than he can afford to pay back. Lay emphasis on the joint and individual responsibility of members. Explain the necessity for the reserve fund and dilate upon the future benefits to accrue from the rule which insists on every member saving a small sum annually. Finally make the fact plain that the formation of the society means the severance of the members of the society *as individuals*

* *Vide Appendix I.*

from existing or future financial relations with money-lenders. The slate is to be wiped clean as regards existing debts which are to be paid off at once out of the funds of the society and in future no loan is to be taken otherwise than from the society. And when you have done all this you must forward the application for the registration of your infant society and your proposed bye-laws to the Registrar and be prepared to satisfy him that there are reasonable prospects of success in the venture.

In both the missionary of and the convert to co-operative credit the personal equation counts for much. In other words a society will succeed if it is started by the right sort of man amongst the right sort of people.

I know that I am an advocate of methods which are not likely to meet with a success both widespread and rapid. But it is far better, gentlemen, to create a few sound examples when you first put your hands to the co-operative plough than to find that nothing save a weakling crop, or weeds, will grow in the furrow you have been at such pains to drive. Moreover I can assure you of this fact, and that is that the formation of societies even on these modified Raiffeisen lines will proceed quite as rapidly as we can expand our powers of supervision and control, provided that a sufficient number of enthusiastic workers is forthcoming.

And now, gentlemen, let us suppose that the rural society has been registered. You have your certificate of registration, your members, your committee of control, your bye-laws and your simple account books and registers. One thing is wanting and that is capital. Let me give those of you who are not already experts in the subject an idea of the manner in which these small societies are financed.

Local Governments and Administrations are empowered to register any society of a suitable nature under the Co-operative Credit Societies Act. Such societies include the institutions known as Central Banks. It is in the

organization of a proper and complete system of Central Banks that the future of co-operative credit finance lies. For it is by means of such a system that our rivulets of banking—the small village societies—can be kept in touch with the stream of the money market. Without such a system the expansion of the co-operative credit movement must be small, for practical philanthropists cannot be expected to supply the whole of the vast capital wanted, and without very careful management capital cannot be kept continuously busy; that is to say, an incomplete system will result in idle capital, reduced profits, shyness of co-operative credit in the money market, and the ultimate death of the movement from starvation.

Now, in England great difficulty has been experienced by village Co-operative Credit Societies in finding the necessary working capital and in dealing with deposits made by members. In fact, until recently, societies have usually been compelled to refuse deposits because they were unable at the moment to make use of them. The type of rural society which I have been pushing in India does not at present deal with deposits: not because it would not be a very good thing indeed to encourage deposits, but because the machinery for the proper employment and control of deposits is lacking.

To meet these difficulties practical philanthropists in England have formed an institution known as the Central Co-operative Agricultural Bank, the purpose of which is to aid, on business lines, the establishment of a network of village societies. One of the leading ideas is that all surplus deposits should be handed to this Bank which will either advance them to societies requiring additional capital or otherwise invest them. The primary object of this English Bank is not the gain of individuals and the dividend payable on shares is specifically limited to 5 per cent. per annum.

The functions of a large Bank such as that I have de-

scribed, would be very usefully exercised in India. If, for instance, there were a sufficient number of Tahsil or District Central Banks in the Central Provinces and Berar the Provincial Central Bank could either invest the spare funds of these smaller Banks for them, or could re-distribute capital which would otherwise remain idle in the coffers of one Bank while another Bank was clamouring for money for the village societies dependent on it. This Provincial Bank, too might combine such duties as are discharged in England by the Urban Co-operative Banks Association. These duties comprise systematic organization of the co-operative movement, the regular and expert supervision of smaller banks, and the spread of co-operative propaganda. The Urban Association is non-political and non-profit-making and it depends entirely on the donations and subscriptions of those interested in the individual and social welfare of the people. I am, at present, in the small zone of co-operative credit in which I am working, much hampered by the constantly recurring danger of idle capital. This fear would be altogether removed had I been working in England, for the Central Agricultural Bank accepts deposits from Credit Societies and small Banks in sums of not less than £5 up to £20, withdrawable at call, or beyond £20 subject to three weeks' notice. The interest paid upon such deposits is at the rate of 3 per cent. per annum.

The original idea of the early leaders of the co-operative movement was independent self-help. All that they desired from the state was 'a fair field and no favour.' Since the great success of German Co-operative Credit with its state-aided banks of finance and control and organization there have been two schools of thought in the movement, one for and the other against state aid. In Ireland Irish Agricultural Banks have been financed to a certain extent by the Irish Department of Agriculture and the Congested Districts Board. The Government of India advances small sums on well-defined lines to Credit Societies, but not, so far as I am aware, to Central Banks of the kind

which I am now dealing with. The Indian societies are also exempt from stamp and registration fees.

In Germany the Central State Bank of Prussia was established at Berlin, in 1895, as a central institution for credit banking operations in the interests of Co-operative Societies in Prussia. The state placed £250,000 at its disposal, which was increased to £1,000,000 in 1896 and to £2,500,000 in 1898. The President of this Bank has stated its objects so clearly that I cannot do better than quote his own words, which are as follows :—

‘The object of the Bank is of a social economic character, namely, to promote and strengthen personal credit for the benefit of the humbler and middle classes, who, being themselves only sparingly endowed with capital, contribute to the production of wealth in the main by their own personal labour. Up to the time of the creation of the Prussian Central State Bank those classes, no matter whether industrial or agricultural in their occupation, had no organized personal credit to fall back upon at a moderate rate of interest and adapted to their particular circumstances, or else a credit only within very narrow limits.’

‘Only by means of co-operation can the capacity for credit and the deservingness of the individual for credit be measured and converted, on a sufficiently large scale, into an economic value capable of being pledged.’

‘The Prussian Central State Bank was formed to bridge over the existing chasm and bring demand and supply together by interposing between them a powerful institution which, having no selfish interest of gain or profit to study, might be employed to satisfy the needs of personal credit on reasonable conditions in the case of the lower and middle classes, united for productive purposes in Co-operative Societies, and at the same time to serve as a convenient Central Money office, in which demand for and supply of funds might be brought into direct contact and made to balance one another by taking from the one and filling into the other, while, in the last place, opening a channel with the great outside working market.’

In 1894 this Bank was in business relationship with 5,438 societies, or 528,148 individual members, by means of 52 Central Banks smaller than itself.

Without embarking on any discussion as to the expediency or otherwise of state aid, I may say that the main arguments against it are that credit so easily obtained is too readily granted, that this leads to unnecessary borrowing, and that therefore losses result which would not

otherwise have been incurred. The arguments for State aid are that the diffusion of cheap credit is of such immense utility in counteracting usury, encouraging industry, and increasing production and so much beyond the power of private capitalists that, in the interests of the whole community, the State should support it even if occasional losses occur. Mr. Devine's views are as follows:—'Like most Englishmen I have a strong predilection for self-help, but I also think that those endowed with greater means and leisure should interest themselves in promoting it and that if they neglect to do so some form of State aid is inevitable.'

One thing however has been proved to the hilt in every country in which the co-operative movement has spread, and that is that to start co-operative credit societies all over the place and then leave them to shift for themselves is a sure road to disaster and discredit. Adequate supervision is an absolute necessity. In India the Government insists upon and grants an annual audit; in Germany there is a compulsory biennial inspection; in England the Chief Registrar can grant inspection of the affairs of a registered society under section 50 of the Industrial and Provident Societies Act which provides for the action to be taken on receipt of application of one-tenth or more of the members of a society.

Many Governments have delegated their powers of inspection and audit to the principal controlling Central Bank. Personally, I hold that proper supervision exercised by the right man in the right spirit cannot be productive of anything else but good. If we are to expect the sympathy and practical assistance of business men in the co-operative movement we must assure them that the societies will, when established, be carefully watched and afforded that stimulus of supervision which conduces to good management. Moreover we have to inspire confidence in order to encourage deposits,

No scheme of co-operative credit will succeed unless it be a practical scheme in which the capitalists of India are willing to co-operate. I will now endeavour to show you that the co-operative credit movement does not oppose the interests of the capitalist but tends to supplement his operations by fostering a form of credit which will lead to increased industry, increased production, and therefore increased business, while protecting him very effectually against those losses which he now frequently incurs in cases of individual default.

An ideal system of finance, from the capitalist's point of view, is the lending of money by a body the liability of which is limited, to a number of other bodies the liability of which is unlimited. Well, gentlemen, here are your Central Banks with their limited liability lending to rural societies of unlimited liability. Provided that your rural societies have been carefully organized on the lines that I have sketched for you, or on lines which observe the essential principles of security and stability, experience has shown that the risk of bad debts is almost abolished.

I have already indicated the manner in which the sapping of independence and the destruction of the spirit of industry is effected by usurious loans and rates of interest and I have pointed out that the accomplishment of these evils is attended by diminishing production and contracting business.

Enough also has been said to enable you to elaborate for yourselves the arguments which maintain that an increased spirit of thrift and self-help and self-respect leads to greater industry, greater productiveness and greater business. It remains to show that the provision of capital at reasonable rates of interest will not reduce the fortunes of those who obtain most of their income from interest.

I must exclude from my argument the petty village Shylock with his armament of trickery and deceit. He is not worthy of the name of capitalist and is an unreasonable

person, whose dealings are generally confined to those with whom, reasonable men will have nothing to do.

Now, to begin with, what does the *mahajan* of India, of respectable standing and turnover, earn on his annual investments? He does business on much the same lines as the tradesman who grants credit to all his customers; he has, that is to say, to charge one customer for the losses caused by another. Moreover, he does business with numbers of people who will not pay him until he puts them into Court. I have on a previous occasion discussed this same question in print, and subsequent opportunities have been afforded me of testing the conclusions I then put forward. It is not necessary on this occasion to enter into any discussion of the rates of interest paid by cultivators. That is a very interesting matter about which there is a great deal of misapprehension. It must suffice here, gentlemen, if I say that repeated and carefully tested enquiries have brought me to the conclusion that, after all the anxiety, dunning, and worry which the money-lender has to face, the average annual profit earned in lending money to cultivators is not more than $8\frac{1}{2}$ or, at the outside, 9 per cent. Work it out for yourselves and see whether this conclusion is approximately correct or not. But work it out by collating facts, as I have done, not by means of imagination.

Now, gentlemen, if the money-lender earns some 9 per cent. only on capital, the employment of which is confined to economic conditions which are capable of enormous improvement, it is obvious, I think, that the co-operative credit movement can do him no harm.

For increased production requires increased capital and, whereas the money-lender has now to lend his own funds, modern methods of finance contemplate the employment of outside capital by money-lending institutions. Not only will the money-lender employ more of his own money under improved conditions and thus increase rather than diminish

his present income, but he will learn to manage the combined credit of himself and his fellows in such a manner as to attract some of the world's spare capital, which is ever seeking investment, and to lend out this capital to the rivulets of banking already described. His profit will, of course, be the margin between the rates at which he borrows and lends this outside capital. The benefits of co-operation are by no means confined to the tiller of the soil, and to those of you who feel hesitation as to the possibility of obtaining outside capital I would tender the assurance that there is not only a reasonable prospect of obtaining it but that there is a certainty that as the co-operative movement gains in strength all over the world—and its growth has now attained vigour and rapidity—confidence in the system will open the doors of the market to you. You may consider, and very reasonably, that I am not in a position to make this assurance. If I am not in that position it must be because there is no scope for co-operative credit in India; it must be because there are not, amongst Indians, men willing to unite for mutual aid and to refrain from exploiting one another. And we know that we need not be afraid that there are no such men in India. The spirit that we call 'public spirit' has long existed amongst you. Had it been otherwise there would be no wells made at individual expense for the public benefit, no rest-houses for travellers built by benevolent persons, and no groves of fine trees planted by some kindly disposed man long since departed to shade generations of tired wayfarers.

We may safely assume then, that, quite apart from the remarkable success already achieved in the Indian field of co-operative credit, what has taken place in other countries will take place here, human nature, with all its intricacies, being much the same the world over. Reflect then that although the co-operative credit movement only originated *sixty years ago* it has already covered the German Empire and spread to Italy, France, Austria, Hungary, Belgium, Denmark, Holland, Switzerland, Sweden, Russia,

Roumania, Servia, Bulgaria, Cyprus, Canada, Java, Japan, and India. Is a phenomenal movement of this kind going to make no further progress?

The annual co-operative turnover in Germany amounts to not less than one hundred and fifty millions of pounds sterling.

In Italy, where the birth of the movement is of much more recent date than in Germany, the Banks of the Schulze-Delitzsch or, as they are sometimes called, the Luzzatti type possess a capital of not less than four millions and-a-half sterling. And besides these there are in Italy the Wollemborg societies of the Raiffeisen type. I will not bore you further with statistics.

Gentlemen, I have taken up much of your valuable time. But before I conclude I should like to suggest to you lines on which those of you who are in touch with what I may term the district or the tahsil money market may organize the local Central Banks which are to be the immediate means of financing rural societies.

I can do this best, perhaps, by describing my own efforts in the Sihora Tahsil of the Jubbulpore District. Do not imagine for one moment that I am an impassioned advocate of my own methods. No stupid claim is advanced that they are free from defects.

On the contrary, I am quite sure that practical experience will find out many weaknesses and imperfections. But you will be able to alter, to adapt, or to improve the lines on which, with my knowledge and experience of an Indian district, I have found it possible to make a start, and I need therefore have no hesitation in describing them to you.

Sihora is a small town with practically no industries and no merchants save those connected with agriculture. The Tahsil is a fertile one, and a hundred years ago the cultivators were in a state of servitude to their creditors, the local money-lenders of that day. British rule has

opened out resources which were land-locked and other means of investment besides the peasant have been presented to the local capitalist. It thus comes about that the Sihora cultivator of 1908 is no longer, as was his ancestor of 1808, the slave of the *mahajan*. But traditional business methods and traditional rates of interest remain as legacies of the past and they stand in the way of prosperity and progress.

It was in Sihora that I made the acquaintance of Mr. Bishun Dutt Shukul, a B.A. and an Honorary Magistrate, who owns several villages which his fathers held before him. First, I made it my business to convert Mr. Shukul to the cause of co-operative credit and, then, after some months of endeavour, I got together some twenty gentlemen with a promised capital of Rs. 2,000. A very small and a very humble beginning; but there was the nucleus of a local Central Bank.

The avowed object of the Bank was to organize and finance rural co-operative credit societies. There were at that time no societies in the Tahsil to finance. But I had already learned from experience that in constructing the edifice of co-operative credit the foundation must be the financing and controlling institution and not a number of rural societies without any means of finance and control. Directors and a Committee of management were selected from amongst the shareholders and the bye-laws—a copy of which has been sent to your Secretary for the inspection of any one who cares to see them*—were framed.

As in the case of rural societies these bye-laws aim at the absolute *mininum* rather than the possible *maximum*. Simple forms of account—samples of which I have also submitted to your Secretary*—were adopted. The rate of interest on loans was to be 9 per cent. per annum. Finally the Local Administration was asked to register the Bank

* *Vide* Appendix I.

under the last section of the Co-operative Credit Societies Act and the request was granted.

Since registration the Secretary, Mr. Shukul, and the Managing Directors have, as the result of little more than a year's work, raised the capital of the Bank to Rs. 10,000. They have also, with great care and circumspection, started and financed about a dozen rural societies. The rural societies are granted cash-credits and borrow as their necessities arise at 9 per cent., lend to their members at 12 per cent., and carry the margin of 3 per cent. to their reserve funds. Encouraging features have been the receipt of several spontaneous applications for registration from villages in which no missionary work has been done and, despite somewhat indifferent harvests, the punctual and voluntary repayment, without exception, of interest and loan instalments. I have now said enough of the Sihora Central Bank to give you an idea of the manner in which it has been found possible to launch the co-operative credit movement in the Jubbulpore District of the Central Provinces.

I set out, gentlemen, to do no more than to introduce you to co-operative credit and it may well be that there are many amongst you who have heard nothing fresh in what I have had to say. Indeed if any of my listeners have ever heard Mr. Henry Devine or read any of his writings they will think this paper a poor echo of a great original. To those of you in whose minds an interest in co-operative credit may have been created I recommend a study of some of the books and papers enumerated in the 'International Co-operative Bibliography' prepared and published by the International Co-operative Alliance (6, Bloomsbury Square, London). I say *some* of the publications because their enumeration covers no less than thirty pages of small type.

Let me impress upon you the necessity of gaining an elementary knowledge of the principles and pitfalls of

practical co-operative credit before you appoint yourselves as missionaries in the field. And, in conclusion, gentlemen, let me wish you success in a movement, the most important aims of which are to train intelligence and character, to provide education in self-control, reasonable prudence, and administrative ability, and to develop other qualities tending to the improvement of manhood and the capacity for being a good citizen as well as a considerate human comrade.

CO-OPERATIVE CREDIT SOCIETIES AND THE PROBLEM OF ORGANISATION.

BY. W. H. BUCHAN, ESQ., I.C.S.,

Registrar of Co-operative Credit Societies, Bengal, Calcutta.

In writing on co-operation for an Indian Conference the limits of a useful discussion are defined. Co-operation, as you all know, has become an economic factor of the first importance in many countries. It has been applied with the fullest success to industry and agriculture, to banking, production, distribution, and other commercial activities. In all these applications of the principle an Industrial Conference must be keenly interested. But in a country like India where the system has been recently and tentatively introduced in one form, it is right that we should concentrate our attention and efforts on the particular experiment which is still on its trial.

Co-operation, I need not remind you, is not an absolute principle which can be applied with equal success to every race and nation. It has an infinite variety of manifestations, and each country has chosen the form which the peculiar circumstances of her people indicated as being most required. Thus Germany chose Co-operative Credit and established a system which has been widely imitated ; in Great Britain the development has been more in the direction of Co-operative Stores, and agricultural organisation ; and so with other countries. In India a

·vast population, poverty-stricken, overwhelmed in debt and usurious money-lending, called out for a scheme which would lessen indebtedness and provide that cheaper credit, which must be the basis of all improvement. Accordingly in 1904 an Act was passed to provide for the establishment of Co-operative Credit Societies. As the people of India are above all things agriculturists, the almost universally selected type of society was that of Raifeissen, which has wrought such immense good to the agricultural populations of Europe. It is of these societies, with special reference to the problem of their combination and organisation, that I wish to speak. In his very interesting paper read at last year's Conference Mr. Gourlay described the benefits, constitution and working of Raifeissen co-operation. I would like in the first place, by way of preface, very briefly to summarise part of what he has already explained to you, and then to take up the tale at the point where he left it.

Expressed in a word, the paramount need of agricultural India is the provision of a cheap and easy credit, hedged round by safeguards against its too easy abuse. The remedy, while supplying cheap capital, must enforce thrift and self-reliance, or the latter end of the raiyat will be worse than the first. This remedy we believe to have been found in the association of borrowers in societies with unlimited liability, which is a brief description of Raifeissen co-operation. To use a well-worn phrase, the weak credit of individual isolation becomes strong in combination ; and the fact that each member is liable to the last stick of his property for the debts of the society is a guarantee that the purposes of loans will be carefully scrutinised, that undue facilities for incurring debt will not be given, and that the whole body will insist on the proper use of the society's money by individual borrowers. Unlimited liability is practicable only if all the members are honest ; therefore they must be well known to one another ; and this mutual knowledge is possible only within a very limited area. Hence such societies are as a rule confined to single villages.

If the area is small enough the possession of money or property is less important than a reputation for honesty ; so that the system can benefit the poorest of the poor. The security of the society and the interests of members are further safeguarded by the provisions (1) that all services must be gratuitous, which gives the management no inducement to conduct the business otherwise than in the interests of the whole, (2) that, before a loan is given, its object must be carefully enquired into, (3) that this object must be such that the loan can be repaid from the profits or the saving effected, (4) that the money must be applied to the purpose for which it is given, on penalty of immediate recovery, (5) that each borrower must provide, for the repayment of his loan, one or two sureties, who have thus a special interest in seeing that the money is properly spent. When the members have got together and the society constituted, it has then to be financed. Capital can be raised principally in three ways—(1) by deposits of members and an equivalent loan from Government, (2) by deposits or loans from local sources, and (3) by loans from outside investors. From personal experience of these various methods I would strongly emphasise the desirability of the two first mentioned. All societies cannot deposit and in very few districts have they so far attracted the confidence of local capitalists. But societies so financed are invariably the most successful. For it is only natural that, where the members have a stake in their society, they should take a special interest in seeing that it is well conducted ; and in a lesser degree the same applies to outside local capital. Lastly there is the management, which is wholly democratic. The ultimate control rests with the whole body of members. In the General Meetings, which are held annually or oftener if necessary, they review the year's work, appoint their officers, decide the amount of liability to be incurred and the rates of interest to be paid and offered, hear complaints and discuss all matters of general interest. The actual management is in the hands of an

elected punchayet. Their duties are to elect and suspend members, receive deposits, grant loans, recover dues, keep accounts, periodically review the work of the society and the financial position of each member, and generally to take all measures for the proper conduct of the work. They meet once a month or at shorter intervals; no business can be transacted except at these meetings; and in the provision that the punchayet can only act jointly there is safeguard against individual domination. They are assisted by supervisors, who are the eyes of the society, and whose duty it is to watch the application of loans and to report to the punchayet any irregularity, misdeed, or weakening of security. At the end of the year they render an account of their stewardship to the general meeting of members.

These are the essential features of a type of society which with local modifications has been adopted throughout India as being suited to the requirements of agriculturists. The policy has been to follow generally the lines which have proved successful in other countries, the conditions of which are similar to those of India, and to leave alterations to time and experience. That adaptation may be necessary, if possible, but that the present scheme has attained a large measure of success is shown by statistics. On June 30th, 1908, there were 1,201 rural banks against 740 at the end of the preceding year. Their members had increased from 54,500 to 93,200 and their working capital from Rs. 10,72,000 to Rs. 21,66,000. These figures do not include the statistics of urban banks which would bring the grand total of the working capital of Co-operative Institutions in India up to 44 lakhs of rupees, or nearly double the total of the preceding year. On such a record co-operation in India can now claim to be doing serious work. Within its still narrow limits it is exercising a perceptibly beneficial effect, both financial and moral. But success only widens the horizon. So far we have done no more than touch the fringe of agricultural indebtedness. We have been working

almost entirely with societies as isolated units. Before the movement can fully achieve its objects or even develop widely on safe lines, a vast amount of organisation will be necessary. So far as credit is concerned the individual society will always remain the beginning and the end of co-operative effort. Organisation is not an end in itself. Its object is to multiply the humble little village societies and to help them in the highest degree to advance the interests of their members—economic, social and moral. On the form of this organisation the future will depend ; and it is to this problem that I wish specially to direct your attention.

Let me in the first place explain briefly why a more elaborate organisation is required.

The more obvious objections to complete isolation are financial. In most districts scattered and independent societies, especially those composed of the poorer cultivators, have great difficulty in securing local capital. Their good work and the sound security of their unlimited liability are not sufficiently patent to counterbalance the attractions of private money-lending, however precarious. While the number of societies is small the Registrar can act as a link with the money market and supply sufficient capital for their needs. But this is a cumbrous arrangement at the best, and practicable only within narrow limits. The rapid growth of the movement has made it impossible for him to maintain that knowledge of the requirements and merits of each society without which he is ineffective as a financing agent. So the growth and utility of these societies is warped. On the other hand there may be certain favoured districts where an excess of capital is available. The societies cannot use it all, and, for want of a distributing agency, the surplus, which might be employed in financing banks in other areas, lies idle or is diverted to other uses. Again the peculiar nature of agricultural finance has to be considered. The demand for money is not continuous, but comes in seasonal rushes.

Roughly speaking the agricultural year is divided into two main periods, one between May and December when money is required for cultivation, the other between December and May when it is not. During the latter period when money is comparatively plentiful and deposits might well be made, the society cannot offer interest sufficient to attract them, because its members do not ordinarily require loans at that time and the one possible source of investment, the Post Office Savings Bank, offers only 3 per cent. interest. So the surplus funds are spent on other objects, often unproductive ; and in the cultivating season, when loans are so greatly wanted, the money is not available.

These are a few of the many financial disadvantages of isolation and they seriously affect the usefulness of societies. Money is not fluid enough ; some are starved while others have a superfluity. The result is that the membership and the scope of societies are necessarily limited and that, as they cannot always satisfy the legitimate requirements of their members, the latter are driven back on the extortionate *Mahajan*. You will see therefore that financial considerations require the creation of some central organisation which will connect the societies with the money market, provide a place of remunerative deposit for the temporary surplus of individual banks, and balance the excess funds of one area against the deficiency of another.

But the drawbacks of isolation are not merely financial. There is the very important question of inspection and control to be considered. The scheme of a village bank which I have outlined above is of the simplest nature. Yet experience has shown that a society when once formed and instructed, cannot with safety be left to work out its own salvation. In most cases, especially in a society's infancy, careful and regular inspection is essential to success. In this matter we are merely repeating the experience of every other country which has taken up

co-operative credit. Inspection is everywhere admitted to be of the first importance. It checks errors, detects misconduct, prevents stagnation, and inspires confidence in the members. No society however advanced can afford to do without it, and it is especially necessary in the initial stages of the movement. Here again there is a limit to the personal control of the Registrar and his staff; and in Bengal that limit has been passed. That Government should be prepared indefinitely to finance the machinery of inspection would be one solution; but it is hardly a sound one. For, if co-operation is going to extend its borders and be a real success, the movement must be a popular and spontaneous one, self-financed and self-controlled. We have therefore to devise some organisation which will provide for the mutual performance of these functions by the societies themselves.

We have now reached the threshold of the second stage of co-operative progress. The problem before us, which may be briefly stated as 'organisation for the purpose of finance and control,' has been faced and solved by other countries; and their experience forms a valuable guide. It is a law of nature that similar conditions produce similar institutions, each stamped with its own nationality, but all conforming to a general type. So we find that the development of a co-operative credit movement follows in every country a well-defined course. National characteristics and varying local conditions produce differences in detail, but the main stages and broad lines of advance are everywhere the same. First we have the little village societies working in complete independence. Success brings wider ideas and indicates the dangers of isolation. Then the societies of a particular area combine for the purpose of mutual assistance. And so the process of development goes on—autonomy tempered by combination—until finally the whole system is centralised in a provincial or national union. It is impossible to foresee whether such a line of development will be found suitable

in this country. It may be said that India is not Europe and that her peculiar conditions call for quite a different treatment. That remains to be seen. Every province is working out the problem experimentally in its own way, and from their combined experience some solution will be effected. Let me describe very briefly the lines on which we are working in Bengal.

We have chosen to organise from below rather than from above. Three years' working has shown that a co-operative credit society on Raifcissen lines can be successfully worked by the cultivators themselves. It has also shown that a financing and inspecting machinery is wanted which will respond automatically to an indefinite expansion, and that the sources of finance and control must be localised, brought to the doors of the societies. If the members have shown sufficient intelligence and mutual trust to pledge their unlimited liability for the debts of their society, it does not seem too much to expect that the societies of a particular area should assume a limited liability for one another by combining in a local union, if it is shown to be in their interest to do so. This we propose to try and effect. But instead of having one union for inspection purposes and a separate central bank to finance societies, as in the case of Germany, we propose to combine these two functions in one institution. Separation would be too involved an arrangement for the Indian agriculturist at present; and besides, a banking union whose success depends on the stability of its affiliated societies, will probably carry out a more effective supervision than a union established for that purpose alone. Briefly then the scheme is as follows.

The sound societies within a limited area will combine to form a union, the objects of which will be fourfold :—(1) to develop co-operative societies within its area; (2) to carry on a banking business with such societies, particularly with the object of balancing excess and deficiency of funds; (3) to control its affiliated societies by careful and regular

inspection ; (4) to settle all matters of joint importance and to further the interests of its members in every way. The union has a share basis, and only affiliated societies can be shareholders. These societies, while retaining a free hand in the matter of accepting deposits from members, can borrow only through the union, which will be the link with the money market. Credit will be allowed to an affiliated society up to ten times the value of its shares ; that is, if the value of a share is Rs. 10, for every Rs. 100 borrowed from the union the society must take up one share. Liability is both limited and unlimited. The first line of security is the joint and several responsibility of all the members of a society for its loans from the union. In addition, each society will be liable up to 5 times the value of its shares for the debts of the union. Thus a doubly sure investment is offered to local capitalists. The management is an exact reproduction of that of the small societies. In the general meeting of shareholders, *i.e.*, the representatives of affiliated societies, is vested the supreme authority of the union. The punchayet carries on the administration in all its branches within the limits laid down by the shareholders. And the supervisors assist and check the work of the punchayet.

... With such a constitution, simple, entirely democratic and controlled, and with the sound double security offered to the public, the union ought to form an effective central bank and to attract that local capital which the isolated societies have seldom succeeded in securing. But almost more important than its function of finance is that of inspection. This will be carried out by clerks trained in the work of audit and each society will be inspected at least once a year. The examination will not be confined to an arithmetical audit of books and balance sheets but will cover the whole duty of a society and its members, with special reference to their knowledge of and conformity to co-operative principles. The Inspector will report on

each society to the union punchayet, which will insist on a society remedying any grave defects on pain of suspension and expulsion. Such Inspectors are at present working under Government in different areas: in time they will become servants of the unions. As I have already said the fact that the success of the union is bound up with that of its societies is a guarantee for the exercise of an efficient control.

That is a bare outline of our scheme. And it does not exist only on paper; for we have this cold weather laid the foundation of three unions. A short description of the first meeting of the Midnapore Union, which I attended, may perhaps be of interest. Although the harvest was at its height the societies attended in good numbers and showed great interest in the scheme. First the rules were read out to them in the vernacular and explained in detail. After an intelligent discussion these were adopted. Then the meeting proceeded to elect the punchayet, Chairman and Supervisors. Next the affiliation fees were paid in full by all, and over 100 shares were taken up by 13 societies. Several wealthy non-members of the neighbourhood were present, and deposits to the value of many thousand rupees were promised. The union is now an established fact and has applied for registration. It has commenced work in earnest by taking up the question of adequately financing its affiliated societies, and it will soon proceed to form new banks within its area. So far the spirit and interest shown are excellent and I have good hopes that the venture will prove a success.

To sum up, I have tried briefly and with very little time at my disposal to explain the lines on which we have hitherto been working; I have indicated how isolation prevents the full growth of societies; and I have outlined the system of organisation which has been put on its trial in Bengal. The scheme is frankly experimental. In default of assistance from previous Indian experience one can only take the system which has had the greatest success amongst

an agricultural population elsewhere and apply it to India with such adaptations as differing circumstances necessitate. The underlying principles are sound ; they have worked well in other countries ; and there appears to be no reason why in India they should fail of ultimate success. The union provides an economic organism which, while enforcing a central control, preserves the autonomy of its affiliated societies. The educative effect on the people of building from below, of making them finance and control each other, must also be great whatever be thought of its chances of success. I think you will agree that such a scheme is at least worth a trial. Meanwhile we shall watch the infant unions. If they succeed the system can be extended ; further centralisation will no doubt follow ; and there is no limit to its ultimate possibilities. Progress will be slow at first inevitably, but it will be on sound lines. It is better to make sure of our ground and to let the movement grow spontaneously than to force an unnatural development from above. On the other hand we may find that unions are possible only among the more advanced populations and that in the backward districts a less democratic and independent system is required. Time will settle that and many other questions. It may take years of patient work and adaptation before an organisation exactly suited to Indian conditions is evolved. But with the united experience of the different provinces and with the help of Indians and non-officials success will come. For, above all things we require helpers. Government can do little more than show the way. Co-operation, if it is to be a power in the land, must be developed by the people themselves. It cannot be too often insisted that the greatest need is for efficient helpers—those with a wide knowledge of the country and its people who will think out the great questions of co-operation and apply them to Indian conditions—those with enthusiasm to initiate and those (not the least important), patient of detail and spade work, who will guide and instruct.

CREDIT INSTITUTIONS IN THE MADRAS PRESIDENCY.

BY R. RAMACHANDRA RAO, ESQ.,

Registrar of Co-operative Credit Societies, Madras.

1. *Preliminary*.—There are several credit institutions in Southern India too well-known there to require description to residents therein. They serve very useful purposes and deserve to be better known ; so, at this gathering of persons from several parts of India, I propose to give below their salient features of working. Full information is available in printed books, the chief of which is Sir Frederick Nicholson's *Agricultural Banks* ; and this paper pretends to no originality in description or opinions.

2. *Nidhi*.—In the usual type of Nidhi, some persons join together and form a joint stock company ; a managing board is appointed and admits members. Each member pays one rupee per mensem on each share and agrees to pay for a number of months—24 or 45 or 84—on the conclusion of the period of which he is paid Rs. 25-8 or 50 or 100 as the case may be. The members are allowed to borrow on suitable security. The advantages are (1) encouragement of savings by the compulsory payments of small sums ; (2) easy loans to the lower middle class to which especially the timely securing of an easy loan is a matter of considerable consequence. It is unsuited to the agriculturists who cannot make regular payments every month. In practical working there are further disadvantages. (1) The Nidhis are unable to meet all loan applications for want of funds as the share subscriptions are low and deposits are not attracted ; (2) in the older Nidhis, the share money is so heavy that it cannot be immediately lent out and lies as dead capital ; (3) the members reside over a wide area and the valuation of the security is always a matter of difficulty and is sometimes fraudulent ; (4) owing to the wide area of residence, the members have not a sufficient bond of interest to effectively watch the directors and take

an active interest in their appointment ; (5) an unreasonable portion of the profits is diverted towards directors' fees ; (6) the penalties for irregular and late payments of the monthly subscriptions are very heavy ; (7) the audit is sometimes imperfect. So long, however, as the board consists of honest and industrious gentlemen, the Nidhi works well ; but when the management deteriorates, the Nidhi is ruined. It is not easy to develop the Nidhi much further on its present lines ; the only suggestion I can make is to suggest, in view of the large sums of money deposited by a confiding public, legislation for compulsory external audit for which the more respectable societies are prepared to pay.

3. *Chit Associations*.—A definite number of men unite to subscribe periodically a certain sum each. The sum is given each period to each of the subscribers by rotation, the choice being effected in several ways—(1) by pure lot where the earlier lot drawers reap undue advantage over the others, or (2) by lot but the lot drawer is fined a certain amount, the amounts held over being distributed at the end, or (3) by auction where a sort of Dutch auction is held as to who will take the least as compensation for the total sum. In partial modification, a system obtains where the subscribed sums are increased at every period. The chits are good savings banks but from their very nature, their scope is limited. The penalties for irregular payment are severe. Its chief defect is its insecurity. The chit is commenced by a person who wants money and who takes the first or the second lot. Unless the association is registered, no member has any right of action against any other and the success of the chit entirely depends on the honesty and means of the organiser, whose position and character are the sources of attraction for the members to subscribe. Consequently, as a general instrument of credit, the chit fails and can only serve special persons under special circumstances.

4. *Provident Funds*.—A company is registered and

members are admitted. Each member contributes periodically, say a rupee a month. At the end of each year the number of marriages (or deaths or other events for which the company is registered) is calculated and the annual income with some deductions divided. At the outset, members are likely to secure amounts several-hundredfold their money paid, and flock in like sheep but in the long run they could not, obviously, get even what they had subscribed. But the rules provide a considerable remuneration for the directors and the society is generally wound up in the third or fourth year of its existence. In general, the fund works as a swindle, moral if not legal, inasmuch as the people are induced to join in the erroneous hope of deriving benefits in excess of their contribution. It is quite possible that if correct actuarial tables are prepared and if the distribution is proportioned to the subscription, the fund need not necessarily be a failure; but expert knowledge is wanting and the evolution of a system of insurance likely to be popular with the rural villages is yet a problem of the future.

5. *Co-operative Credit Societies.*—The usual type of a rural society in the Presidency follows in the main, the Raiffeisen Society of Europe. The operations are confined to a small, very small area. The members individually and in a body pledge their unlimited liability for the common debts. The managing body is elected by the general body of the members. In their own interests, this body is very careful in sanctioning loans and watching that the borrower does not waste his status to such an extent as to render recovery difficult or doubtful. The educative influence of a society is marvellous. So far as this Presidency is concerned, the careful initiation of the societies hitherto organised, has sufficed to attract private capital for working. But the very constitution of a society creates limitations. (1) The more well-to-do people hesitate to enrol themselves as members; (2) the members do not always realise how to watch and influence the conduct of

the committee ; (3) if the leading men are money-lenders, the scope of operation gets narrowed ; (4) loans are small and cannot satisfy all needs ; (5) the work is unsuited to urban areas ; (6) the society does not necessarily inculcate thrift. However, with spread of education and the formation of unions capable of dealing with large capital, several of these limitations will disappear in course of time. Several co-operative credit societies run Nidhis and chit associations, and the members of the latter are necessarily members of the society, thus obviating risks ; but as the area of operations is small, the transactions are limited.

6. *To sum up.*—A Nidhi is a very good institution for thrift, and when well-managed, will work well ; but when owing to growth or indifference, the management falls in bad hands, it is ruined ; in the nature of working it has reached its highest possibilities. Chit associations attract through the appeal, slight though it be, to the gambling instinct of man, but with the growth of sounder and easier credit, are bound to disappear. Provident funds on the present lines will disappear with the spread of co-operation and with increased activities of insurance societies, and with a knowledge on the part of the general public of its present methods of work. The credit institution of the future is the co-operative credit society, but only time can solve if it can all along attract enough capital and if it can be developed to deal with large individual loans ; and what is at present required is diffusion of knowledge of its methods of work and considerable help from the non-official public in starting societies throughout the length and breadth of the Presidency.

AGRICULTURAL BANKS AND CO-OPERATIVE SOCIETIES IN THE MYSORE STATE.

BY M. SHAMA RAO, ESQ.,

*Registrar of Co-operative Credit Societies in Mysore State,
Bangalore.*

In the Mysore State, there existed prior to 1894 no institutions of the kind which are in official parlance now known as Agricultural Banks and Co-operative Societies. The question of the establishment of Agricultural Banks had been from time to time brought up for discussion in the Representative Assembly, till at last Dewan Sir K. Seshadri Iyer announced in his speech to the members of the Representative Assembly held in October 1894 the approval of a scheme by His Highness the late Maharajah Chamarajendra Wodeyar for the introduction of Agricultural Banks in the State on the lines of the Raiffeisen Banks working in Germany. The problem for solution was set forth by Sir Seshadri Iyer in these well-chosen words :—

‘On the one hand, we have large accumulations of unused capital in the country as evidenced by the balances in the Presidency and other Exchange Banks, the refusal of the former to receive any private deposits except as current ones carrying no interest, and the high premium which the Government of India 3½ per cent. securities command. On the other hand, we have the agriculturist suffering from inability to raise the funds required for his *bona-fide* purposes except at ruinous rates of interest. In our own State, the balance of the Government Savings Banks deposits has risen from 4 lakhs in 1881 to 28 lakhs during the last year and 73 lakhs in the current year, though the rate of interest was recently reduced to three and four-sevenths per cent., but the borrowing power of our raiyat is nevertheless as low as ever. The substantial agriculturist, especially the coffee-planter and the grower of exportable produce, is able to obtain some credit from the foreign buyer on the security of his crops at 9 and 12 per cent. interest, but the ordinary raiyat is unable to get any credit except at usurious rates of interest. How to bridge over the wide gulf that thus separates capital from want is one of the most important problems of the day in this country.’

2. It was believed that the existing conditions in Mysore offered no insuperable obstacles in the way of the establishment and successful working of associations similar

to Raffeissen Banks, under the designation of Agricultural Banks. Indeed, it was even considered that in the Mysore State the tracts in which the *Suthigi*, a system according to which the gowkars accommodate their debtors with all the loans they need from year to year and receive free produce grown by them, according to valuations fixed by the gowkars themselves, and crop advance systems existed, afforded highly favourable conditions for their establishment.

3. In 1894-95, the first year in which the scheme was placed on a workable basis, a modest beginning was made with two Banks. They were followed by three more in the next year, by 17 during the third, by 38 during the fourth, and by only 4 in the subsequent years. A special officer was appointed in December 1896 to examine into the working of the Banks, to scrutinize and report upon new Banks proposed to be formed, and to explain to the inhabitants of rural tracts, the principles on which such Banks should be founded and worked. In his address to the Representative Assembly in October 1895, Sir Seshadri Iyer expressed the earnest hope that these beneficent institutions, which, in spite of their novelty had received practical and encouraging appreciation at the hands of the people, would spread all over the province and that the public confidence in their stability and usefulness would grow day by day, and that ere long the Banks would be financed solely by the peoples' money without any help from the Government Treasury. Again, in his address of 1897, he stated that the interest which the landholding classes had begun to take in the formation of Agricultural Banks was full of hope for the future of the experiment. The amount advanced from the Government Treasury to the 38 Banks which had by that time come into existence was 11¾ lakhs of rupees. In 1897-98, on the strength of the inspection reports which reached Government, it was stated that the Banks, which were 62 in number at the time, benefited their members by enabling

them to discharge debts bearing usurious rates of interest, to undertake the cultivation of the more remunerative crops, and to dispose of the products of their labour to the best advantage in the open market. It was also stated that the Banks had indirectly led to reduction of the rate of interest by money-lenders in their neighbourhood.

4. It was however soon discovered that the growth of these institutions would not be as anticipated. The outbreak of plague in many parts of the province and the consequent general depression in trade and business, to some extent retarded their development. There were however deeper causes for the unsatisfactory results which have attended the Agricultural Banks so soon after their formation. The defect lay in the unusually large advances of money given by Government at cheap rates of interest to the members of the Banks. The members also were not all of them, strictly of the classes and occupations for whose benefit the Banks were intended. At present there are only 25 Banks nominally in existence, only three are doing any business, the rest merely collecting the debts due from the members and repaying the Government loans taken, in irregular instalments. These Banks have disappointed the high expectations formed of them at one time, but the disappointment is as much due to the generous loans granted by Government as to lack of close supervision of the use made of these loans, and we find confirmation for this statement in the results of Co-operative Credit Societies in recent years.

5. The preliminary legislation needed for the introduction of these societies was undertaken in 1905 and an Act on the lines of the British Indian Act, X of 1904, was passed in June of the same year. The Dewan acknowledged in his address to the Representative Assembly of 1905 that the problems of Agricultural and Industrial indebtedness and of material advancement of the cultivating and artisan classes were too important to be left to themselves in these days and that intelligent guidance had

become an absolute necessity. His Highness the Maharajah has all along evinced the keenest personal interest in the development of the movement. In the very first year that the movement was inaugurated, His Highness was pleased to make a grant of money from the Privy-purse for financing the societies in the early stages of their existence. Again, in his speech on the occasion of the Industrial and Agricultural Exhibition at Mysore during the Dussara festival of 1907, His Highness commended the object and usefulness of this movement in the following clear and succinct language :—

‘ I have little doubt in my own mind, that the main difficulty which at present prevents large classes of the community from successful competition in industrial and other enterprises is the deficiency of organised capital and the want of confidence between man and man, of which that deficiency is in no small measure the result. Under the co-operative system, any local body of craftsmen or agriculturists, however poor and however limited in numbers, has the means of acquiring gradually and from small beginnings, sufficient capital to provide for immediate needs and for future progress, and I would urge on all educated and enlightened men, whether immediately concerned or not, with agriculture, crafts or commerce, the duty of promoting these societies to the extent of their ability. Apart from the material return, which is their immediate object, such societies have, in every country where they have taken root, proved great moral educators and promoters of mutual confidence, self-reliance and honest enterprise.’

Mr. V. P. Madhava Rao, C.I.E., Dewan, in his address of this year to the Representative Assembly, impressed upon the members that in the co-operative movement ‘ was a field of activity which offered considerable scope for disinterested, if quiet, public work fraught with possibilities of much real benefit to the country.’

6. These commendations from His Highness the Maharajah and from the highest administrative officer have gone a great way in impressing upon the popular mind the importance of the movement. In the beginning the movement had to contend against the prejudices which had been raised against such movements in general by the acknowledged failure of the agricultural banks, and people were

chary of the whole movement fearing that by associating themselves with it they would incur unknown risks. The first co-operative society, *viz.*, the Bangalore City Co-operative Society, which has developed into a very successful institution at present, was registered on the 8th December 1905, and before the close of the official year on the 30th June following, four more societies were registered, two of them being agricultural societies. In the succeeding official year the number of societies rose to 15, and in the third year, which closed on the 30th June last, the number increased to 27. Since then, 8 more societies have come into existence and the movement has become known in all the eight districts of the State.

7. Of the 27 societies which existed in the beginning of July last and for which alone statistics are available, 9 were agricultural, 3 banking, 6 productive (industrial) and 9 distributive societies. All the societies were worked on the limited liability basis, except one which ventured to adopt unlimited liability, this form of liability not yet finding favour with the people in consequence of the rude shock it received by the failure of the Agricultural Banks in the State, although signs are not wanting that ere long the rural societies intended for the benefit of agriculturists and artisans will adopt unlimited liability.

8. Of the 9 agricultural societies, 4 were grain banks. The 6 productive or industrial societies are all societies started for the benefit of the weaving class except one which is intended for the benefit of those rearing silkworms and reeling silk. The Weaving Society at Melkote where Sri Ramanujacharaya has established a famous shrine, is under the guidance of a local merchant who is himself a weaver by caste and profession. The Society obtains small deposits of money by easy deductions from the profits or wages of its weaver-members who obtain yarn from the society and sell the manufactured articles to it. When these deductions total up to a fourth of a share allotted to a member, the deposit is appropriated towards the payment

of the share-amount. This method has had an excellent effect in inducing thrift on the part of the members and creating an interest in them for the progress of the society.

9. The number of members of all the societies, which was 750 at the end of the first year, rose to 2,521 at the close of the third year. Excepting the four grain banks which had their capital in grain, all the remaining societies had paid-up share-capital which rose from Rs. 11,087 at the end of the first year to nearly Rs. 56,000 at the end of the third year. The deposits received during the second year amounted to Rs. 5,450 while in the third year it was nearly treble this amount. Of the sums which had been advanced from H. H. the Maharajah's Fund, amounting to Rs. 1,000, Rs. 300 were paid back, and only a very small sum of Rs. 200 had been utilized from the Government grant placed at the disposal of the Registrar.

10. In 1907-08 loans to the extent of Rs. 95,000 were disbursed in 2,813 cases, and the repayments amounted to Rs. 73,000. Only one case of default was reported during the year. The members are on the whole punctual in repaying their dues, and unless a member persistently defaults, credit is as a rule not withheld from him.

11. The loans granted on the simple bonds of members or on the security of their shares and deposits preponderated. There were only 29 cases in which loans were given on the pledge of moveable properties and 53 cases on the mortgage of immoveable property. In 80 cases, the borrowing members were required to produce sureties. Correct statistics regarding the purposes for which loans are taken are not available, because most of the societies are not at present in a position to insist upon this information being furnished, as any question on the point is to some extent resented by the borrowing members as being inquisitorial. However, the following comprise most of the purposes for which loans are granted:—

I. Purchase and improvement of land,

2. Cultivation expenses,
3. Purchase of cattle,
4. Payment of assessment,
5. Purchase of raw materials of industry,
6. Purchase of food-stuffs and other necessities, and
7. Marriages and other ceremonies.

As regards the period of repayment of loans, except in one case, no loan was granted for a period exceeding one year.

12. The total receipts and disbursements of all the different types of societies amounted to Rs. 2,43,000 and Rs. 2,33,000 respectively. There was a net profit of about Rs. 5,300 at the end of the past official year. The reserve fund increased from Rs. 160 at the beginning to Rs. 924 at the end of the year.

13. There were only four cases of dispute in the past year and in all these cases the claims were allowed in favour of the societies preferring them. Generally speaking, there have been very few disputes till now, and considering the fact that the management of the societies is characterized by care and caution on the part of the Managing Committees, it does not appear that in future there will be any large increase in the number of disputes.

14. On the whole, the movement may be said to have passed beyond the experimental stage and it now appears that facilities may be freely offered for societies to come into existence in larger numbers. It has been proved that loans from State Funds are not always essential for the successful working of these institutions. An assurance that Government is ready to advance small loans if an application is made, has created sufficient confidence and enabled most of the societies to find their own funds. A Central Bank for granting large loans which may be needed for rural co-operative societies is now in course of formation, and with proper security and supervision, this Bank will be ready to advance any sum that may be required. It thus appears that what the Agricultural Banks failed to achieve,

Co-operative Societies are likely to accomplish under the fostering care of His Highness the Maharajah and of his Government, Mysore being the first Native State to follow the British Government in the adoption of the Co-operative movement.

A SCHEME OF A CENTRAL FINANCING SOCIETY

BY

The Hon'ble SIR VITHALDAS D. THACKERSEY, *Kt.*,

AND

LALUBHAI SAMALDAS, ESQ., *Bombay.*

The following paper was presented by us at the Co-operative Societies' Conference held in Bombay early this month, which was opened by His Excellency the Governor. After a full discussion at a meeting of the Conference the following resolution was unanimously adopted :—

'That this Conference supports the scheme for a Central Financing Society placed before it by the Hon'ble Sir Vithaldas D. Thackersey and is of opinion that a Central Bank is necessary to finance Local Societies and that capital cannot be attracted at reasonable rates unless Government gives some such guarantee as is proposed.'

As the subject is one of all-India interest, we have thought it advantageous to place it before this Conference with a view to eliciting the opinions of representative men in other provinces.

The subject of this paper has been present to our minds almost ever since the passing of the Co-operative Credit Societies Act. The need of a central financing agency has been felt in all countries where the movement has gained a footing. We do not think it necessary to establish at length the need for such a Society on the present occasion. The rural societies cannot have direct access to the money market for various reasons. Their requirements are small. Their credit is not realised by the

Joint Stock Banks and the general investing public. They want long term loans at a lower rate of interest than that ordinarily charged by the village sowcar.

On the suggestion of Mr. Macneil, first Registrar of Co-operative Credit Societies in this Presidency, we started two years back the Bombay Urban Co-operative Credit Society with this object in view. All the available funds of this society were readily taken up and now the Society has had to reject several applications from village societies owing to the fact that more advances could not be made without enlarging the basis of the Society. Mr. Lalubhai Samaldas and some other gentlemen have individually advanced sums of money to several village societies. But this kind of assistance cannot be relied upon. Mr. Carlyle, who presided over the Conference recently held at Simla, said: 'The need for sufficient capital to supply all the needs of members is another point which had been very clearly brought out in many of the reports, and unless this problem is solved the movement was bound to end in ultimate failure. Again if the Societies were to succeed they must attract outside capital on business terms, and this could not be done if the interest paid were too low.'

Sir Vithaldas D. Thackersey had prepared a scheme for a Central Agricultural Bank, which was published in the *Times of India* last year. Mr. Lalubhai Samaldas put forward before the Conference of Registrars recently held at Simla, a scheme on the same main lines with a few modifications in the light of criticisms passed on Sir Vithaldas's scheme. We do not think it necessary to reproduce here the schemes as originally put forward and as subsequently modified. The chief objection taken to these schemes was that they were not absolutely co-operative that they proposed to make advances to individuals and that in addition to advancing money to agricultural societies and individuals they proposed to do general banking business.

These objections are not insuperable, but in order to make a start as soon as possible, we have framed a smaller scheme which is not open to them, and which, we think, will be of very great benefit. In this scheme we omit the proposals regarding advances to individuals and of doing general banking business. The Society will make advances only to Co-operative Credit Societies whose needs are urgent, and to meet which this smaller scheme may be adopted at once, leaving the larger scheme, to which we attach great importance, for a fuller discussion as opportunity offers. We are induced to take this course by the further consideration that the successful working of the smaller scheme will pave the way for and be a stepping stone to the larger. We may add that though the proposed Society is not co-operative in the sense of being a joint effort of co-operative credit societies, the promoters will be glad to give every encouragement to the more flourishing societies to hold shares and to make deposits in the Central Society from their surpluses. This is the best that can be done at present. Situated as most of them are, it is hopeless to expect them to take the initiative in the organisation and working of a Central Society such as that proposed by us.

With these observations, we proceed to outline the principal features of the scheme.

(1) The Society to be a Co-operative Urban Society to be registered under the Co-operative Credit Societies Act, the share capital to be obtained in the open market.

(2) Share capital at present to be 5 lakhs, with power to increase it to 25 lakhs.

(3) The Society to be authorised to issue 4 per cent. debentures to the extent of four times of its paid-up capital and reserve fund.

(4) The interest on these debentures to be guaranteed by Government until payment.

(5) Debentures to be repayable at the end of 28 years.

(6) The funds of the Society to be used only for making advances to Co-operative Credit Societies.

(7) The term of advances to be not more than 10 years, liable to renewal at the option of both parties.

(8) Advances to be made only on the recommendation of the Registrars of Co-operative Credit Societies.

(N. B.—This condition is put to ensure greater security to Government, but if Government do not desire it, it may be left out.)

(9) The maximum rate of interest charged to co-operative credit societies to be 8 per cent.

(10) Government to have the right of inspecting the books of the Society.

The essential feature of the above scheme is the Government guarantee of the interest on the debentures. This is indispensable until at any rate the investing public has gained sufficient experience of the working of the Society to feel confidence in the safety of moneys lent to co-operative credit societies. Such a guarantee is absolutely necessary to attract capital to the project. It alone will enable the Central Society to get sufficient funds to finance the village societies at a rate of interest at which they can profitably borrow from it. Again, our experience, and that of everybody who has studied the subject of the organisation of rural credit has been, that if loans are to be of any use to agriculturists they should be long term loans. The investing public usually do not make deposits for a longer term than 12 months and it is obvious that it is not sound finance to borrow money for twelve months and lend it for 10 years as the Madras Central Urban Bank is understood to be doing. Such an arrangement may lead to the collapse of the Society at any moment. It should never be forgotten that the rural societies to which the money is advanced, are, as a rule, not very regular in their repayments, while the Central Society will have to repay its deposits on the due date.

It may be pointed out that the security that Government have for their guarantee, is ample. We have no objection to the receipts and other documents being placed in such custody as Government may approve. As the Government guarantee will be limited to a loan of not more than four times the subscribed capital and reserve fund of the society, there will be a margin of 20 per cent. which must be regarded as ample security in case of any untoward circumstance.

As Co-operative Bank business has been proved by experience to be very safe and steady, it is believed that Government will not hesitate to give this guarantee which is essential to the success of our scheme.

Sir Vithaldas who read the above paper added :

I will make a few remarks in order to point to you that in every civilized country in the world, in most of the civilized countries at any rate, it has been recognised to be the duty of the Government to help the agriculturists liberally. I will give an instance in Germany. The Imperial Bank which is the counterpart of the Bank of England has thus assisted the agriculturists. In 1895 the Government placed at the disposal of the Bank £250,000 for the working capital ; in 1896 it placed 10 lakhs of pounds and in 1898 the amount the State placed at the disposal of the Bank was $3\frac{3}{4}$ crores of rupees. Now, the President of this Bank has stated its objects so clearly that I think I shall read his words to you. The President of the Bank said : ' The object is of a social and economic character, to promote and strengthen personal credit for the humbler classes and middle classes who being sparingly endowed with capital contribute in the main to the State . Up to the time of the creation of the Prussian Central Bank, those classes, industrial or agricultural, had no personal credit to fall back upon. The Prussian Central Bank was formed to bridge over the chasm that existed, which, having no selfish interest might satisfy the ends of personal credit on reasonable conditions in the case of the lower and middle classes united for

productive purposes, 'and at the same time to serve as a convenient central money office in which the demand for and supply of money might be brought together, and in the last place to open a channel for the discharge of money.' That is the great difficulty with our Co-operative Societies—they cannot be in touch with the money market of the cities of India. If we have such a central agency it will be the means of bringing money to those Co-operative Societies from the money market. In this scheme as you will have seen, we have confined the operations to Co-operative Societies only. We believe there is a large scheme for not only helping men through the co-operative societies but whenever co-operative societies cannot serve or are not willing to serve, to lend money to individual agriculturists also. There are many cases where the society being small will not undertake the large task of giving much help to individual agriculturists—just like big Zemindars and others who want thousands of rupees to repay their old debts—of course in such cases the Central Society can do a great deal by helping these individuals. We thought that instead of fighting for the larger scheme to which many Registrars were opposed and in respect of which the Government might think twice before giving help, we might have the smaller scheme than do nothing at present. As I said, the scheme was presented at the Bombay Conference and there is reason to think that the Bombay Government is quite in favour of it. We can do a great deal even with regard to this limited scheme. Where there are no co-operative societies, we might ask people to form them and lend moneys through them.

THE INDIAN SYSTEM OF BANKING AND OTHER BUSINESS

BY RAI BAHADUR LALA BAIJ NATH, *Agra.*

The Hindus have always been expert accountants and their system of accounts has always commanded the admiration of foreigners. During the Mahomedan régime Hindu accountants were always employed in all treasuries and account offices and Raja Todar Mall, Akbar's Minister and financial genius, is too well known to need detailed description. He was Akbar's chief adviser in all matters of finance, currency and revenue, and the present system of Indian book-keeping is said to be due to his initiative. Even now in all Government treasuries and English banks, the Indian system of accounts is in vogue along with the English system and so accurate is the former thought to be that the latter is always checked with it. It is, at once, a cheap, effective and easy system and ought, with a little improvement, to have a wider recognition. In this paper I shall briefly describe our system of accounts, banking and other business and show what changes could most usefully be made in it in order to make it fit in better with the altered conditions of Indian trade.

The Indian Shorthand.—In most parts of India, in all banking and business concerns accounts are usually kept and correspondence is carried on in what is called the *Mahajani*, *Sarafi* or *Muria* character. It is the short-hand of the Hindi alphabet. All unnecessary or redundant letters, marks, vowels, and consonants are done away with. It is written from left to right like Hindi, but without the headlines and is therefore called *Muria* or head-less. With the exception of the beginning or end of words, no vowels or vowel-marks are employed in words or sentences and the reader is left to decipher it in the best way he can. An untrained hand is likely to make serious blunders both in reading and writing, but to one who has been trained in it it presents no difficulty and the reading is almost as accurate and rapid as the writing.

Business Education.—The education of boys destined to a business career commences in small indigenous schools called *Patshalas* or in private shops or firms. At the age of 6 or 7, they start with writing and committing to memory the multiplication tables and whilst the English tables stop short at only tens, the Indian go on to twenties, thirties, forties, and thence to fractions—of quarters, halves, three-quarters—thence to compound numbers of $1\frac{1}{4}$ (*savaija*), $1\frac{1}{2}$ (*deora*), $2\frac{1}{2}$ (*dhoucha*), $3\frac{1}{2}$ (*puchā*) and conclude with the square of two numbers up to 100 called *bara-aika*. It takes an ordinary boy two years to learn these tables and he is then able to calculate—add, subtract, multiply, divide—and extract square roots both simple and compound, all from memory in a few seconds without the aid of pen, pencil, or paper. No books are employed, though of late some have been compiled. The system is all learnt from rote. Boys are taught to write on small, oblong, wooden boards called *tukhteas* or *puttees* which are coloured red and washed off every day at the beginning of the school hours. These are generally from 7 to 11 A. M. and from 2 to 5 P. M. The writing is done with bits of chalk, or the time-honoured Indian reed and chalk dissolved into a small earthen pot. The whole apparatus does not cost more than two or three annas and lasts for months. No fees are charged in private firms or shops. In schools a fee of two annas or at the utmost 4 annas a month is charged, or the teacher is paid a rupee or eight annas at each festival like Holi, Dussehra and Diwali.

In all schools, both at noon and in the evenings before the classes are dispersed, all boys are made to stand or sit in a row and repeat the multiplication tables from the simplest to the most complex, after the senior boy who takes a pride in acting as monitor. In this way these tables stick to memory and serve a useful purpose in after life, and many a Hindu graduate in an English College feels the advantage of having attended one of these indigenous schools in his earlier years in the help he gets in his mathematical studies from what he learnt there. And

whilst much of what is learnt of higher Mathematics in Geometry or Algebra in the English College, is soon forgotten, the education received in the *Pathshala* is useful throughout life and enables one to dispense with the use of pen, pencil or paper in making calculations on most occasions. As soon as a boy has mastered the system of the multiplication tables, he is taught the *Muria* character above described. He learns to write in it names or sentences in about a month and is then given the work of calculation of prices of various commodities from a sack of wheat to a bar of gold in *tolas*, *mashas* and *ruttis*, till he becomes an expert in making out bills and invoices. His education was hitherto free, no premium except the small fee above mentioned is paid by him either to the firm where he studies or to his teacher in the school. In the latter he never gets any scholarship or prize, in the former he is allowed a pice or two per day as pocket money. He is now fit to be an apprentice accountant in a business firm where he is made to start with four or five rupees a month and is placed under one of the regular accountants to learn book-keeping. This he does in about a year and is then given the simplest work to do and as he progresses, is entrusted with the writing of the cash-book, the ledgers and other regular accounts of the firm. By the age of 13 or 14 he is able to earn his bread as an ordinary accountant or attend to the business of his father's firm if the latter has one. In the former capacity he gets about Rs. 75 or 100 a year *plus* a suit of winter clothes. If he is a lad of parts he makes his way up and finally rises to be the head accountant of the firm and is placed in sole charge of its affairs on a salary of Rs. 25 or 30 per mensem or takes up the management of his own family business. An accountant who is able to earn so much, is considered to be a very capable and respectable person and if he is honest and painstaking his services are in great demand and he is often sent out as manager or gumashtah on a salary rising from Rs. 50 to 100 or 150 per mensem. There

he is trusted and respected as much as the proprietor of the firm and commands much influence in the commercial world. He is not infrequently taken in as a partner by his employers or does business on his own account. Thousands of rupees pass through his hands every day and so great is the confidence reposed in him by his masters that he is given a free hand in everything and has the making or marring of the latter's business entirely in his hands. It must, however, be said to the credit of the great majority of our Indian *muncems* and *gumashtas* that they seldom betray their trust. On the contrary they safeguard their masters' interest as zealously as their own. Some of them succeed in amassing considerable fortunes in the course of a few years and become *Settias* or *Sahukars* like their masters. As they advance in business they make their way into high official circles and courts of Indian princes and earn titles and honours from Government and every one who knows the history of some of our large banking houses, will at once testify to the fact how its present proprietor was once a mere clerk or an accountant in the firm on a few rupees a month. As an instance may be mentioned the founder of the great house of the Settias of Muttra which owed its rise to the capabilities of Lakhmichand, a *gumashta* of Parakji of Gwalior which was in its turn ruined by the carelessness of a *gumashta* who failed to honour a small hundi in an outstation. Our system of training is thus not only inexpensive but also produces good and efficient men of business.

The only defect in it is that the men trained under it are generally incapable of taking broad views of things or rising above their traditions. If you suggest to them anything out of the way, they would be the last persons to fall in with your views.

What is required, therefore, is that men who have received modern education, should turn their attention to the Indian system of accounts and come forward to act as accountants and managers in Indian firms. If they do so

they will soon be able to carry their system of banking into spheres into which it has not moved. The Indian banker feels not unoften his want of knowledge of foreign markets, but it is too late for him to learn, and he has to depend upon others for information as to what is going on elsewhere. He knows nothing of commercial history, geography or political economy which has made the western trader great and is thus greatly handicapped in his business. It is for the modern man of education to come forward and supplement his effort. Everywhere in Indian banking and business circles, there is now felt a dearth of good and reliable accountants and many a graduate now pining for employment, will at once increase his opportunities of earning a decent and honourable livelihood, if he but learnt the Indian system of accounts and book-keeping. This is being done in some places and schools have of late been started for the purpose. But everywhere private firms would also always be found willing to take in educated men as apprentices. Only it requires some courage and condescension on the part of our undergraduates and graduates to sit and work as common clerks under men whom they consider to be their inferiors in education. If they but have the patience to undergo the training, they will soon see the result. I can assure them that many a boy of 12 or ¹³ ~~14~~ trained under the old system is able to manage a small firm or business concern and earn his livelihood in a manner which many a product of our Universities might well envy. As soon as their fathers die these lads step into the business as heads of the firm and do not feel the loss so keenly as those who have not had a practical training in the affairs of the world would.

The system of doing business.—Our accountant, gumashta or proprietor of the firm is now in business and we will see how he does it. He takes up either banking or wholesale or retail trade in goods of a particular description. If he takes up the former he is called a *Sahukar*, *Hundiwal* or *Sarráf*, if the latter an *Arti* or a shopkeeper. Suppos-

ing he takes up banking, he starts the firm under two names, either that of his father and himself, or of himself and one of his brothers, or of himself and a partner. Only two names are employed in designating a firm, though there may be more than two partners in it. The name of the firm so started continues long after its originators have ceased to exist. The words '*so and so* Company, limited,' or unlimited, or *so and so brothers* or *sons*, employed in European trade are seldom used by the generality of our firms. They are all carried under precise and specific designations, for instance Lakshmi Chand Maniram, Radha Kishan Govind Dass, Harmukh Rai Dulichand, Balaprasad Manoharlal. Limited or Joint Stock Companies have of late come into existence in Indian business circles, but the great majority of our bankers and traders including those doing very large business, and having a considerable portion of the trade of the country in their hands, are still private firms. Before the introduction of the money order system, the number of banking firms in every town was very large. Now only a few houses can afford to do a purely banking business. Most have to supplement it with trade in goods, often as wholesale export and import agents. Hundies are still drawn and deposits kept by bankers but the introduction of the money order and savings bank system has told most seriously upon Indian banking, which has also to compete with joint stock banks started with European capital in every large town. On the other hand the failure of two such houses as those of the Settias of Muttra and Shahjee of Lucknow has also tended somewhat to shake the confidence of Indians in private firms and the low rates of interest paid on deposits by joint stock banks are often preferred to those paid by private bankers. But even now banking, if honestly managed, is a paying business in India and, if the working is not very expensive, a bank, public or private, started with moderate capital soon establishes itself in public confidence. As instances may be mentioned, the Oudh Commercial Bank of

Fyzabad, the Benares Bank of Benares, the Vyapar Sahayah Bank of Meerut. The last mentioned institution was started about six years ago with a capital of one lac of rupees by a small number of shareholders and is now in possession of deposits worth about 2 lacs, and has been steadily paying for the last three or four years a clear dividend of 9 per cent. per annum, which is more than can be said of many a more pretentious institution worked under foreign management. The secret lies in the working expenses being kept low. The accounts are kept both after the English and the Indian system, but the working expenses are small. Highly paid establishments have not been found to be necessary and with honest and careful management the business is steadily increasing. The history of other Indian banks is also the same. A large portion of their business now consists in advancing loans to traders, landholders and agriculturists. The interest charged varies with the security offered and the credit of the borrower in the money market. Amongst bankers it varies from Rs. 5-4-0 to Rs. 7-8-0 per annum. The usual rate being 7 as. 9 ps. per cent. per month, for good and respectable traders it is 10 as. For loans upon landed security it is from 8 as. to Re. 1 per cent. For agriculturists and working classes who have no security to offer except their wages or the produce of their fields, it is from 1 pice to an anna per rupee per month. On banking loans more than 10 as. is however seldom charged. It is the lower class of money-lenders called Bohras, who charge high interest, but they often lose their money or are put to great trouble in recovering it. Amongst bankers and respectable traders money is usually borrowed through hundies. The banker or trader draws a hundi upon himself for the amount required and employs a broker to negotiate the loan for him at a rate of discount proportioned to his credit in the money market. If the demand for money in the local market or in those with which it is connected like Calcutta or Bombay is brisk, the rate will be comparatively high, otherwise it will be low.

If the credit is good it will be from about 14 as. to Re. 1 for 61 days. The broker who negotiates the loan is allowed half an anna per cent. as brokerage by the lender. After the loan has been negotiated he informs his client of it, and the latter gives him a hundi drawn upon himself in favour of the person who gives him the money payable in 61 days from the date on which it is drawn. The person in whose favour it is drawn then pays the money *minus* his discount. A banker whose hundies fetch low discount, say 14 as. per cent., for 61 days is considered to be a good security and to give him money is looked upon as a sound investment. Most of the business in all Indian trading centres is done by this means and hundies are freely drawn by all bankers and respectable traders upon themselves to raise money for immediate needs. If a hundi is required to be paid in an out-station, it is generally drawn upon the drawer's agency which has either money to his credit or receives goods of equivalent or higher value for sale. This hundi is either in favour of the person who has applied for it and paid the money or in favour of the drawer's local firm. It is payable either on demand or within a period mentioned in it. The general custom is to make such hundies payable in 51 days from the date they are drawn. If the hundi is payable on demand the words *pahuchè dām* (money on receipt) are used. If it is to be paid within a specified period, the latter is mentioned in it. If the hundi is negotiated the endorsement is *hundi baichi* (hundi sold). As soon as a hundi is drawn, the person upon whom it is drawn is informed of it. On arrival the payee immediately sends it to the drawee who endorses upon it the word 'seen' (*daiikhi*) with the date and if it is payable on demand either pays the money immediately or during the course of the day. All hundies are generally paid up to 2 P.M. or evening and so particular is a banker expected to be in this respect that he wanted to sacrifice everything to keep up his credit in the market. If once a hundi falling due on a particular date remains unpaid he

is ruined. If one hundi is dishonoured except when the drawee has no funds to the credit of the drawer, the business at once fails and demands pour in from all sides till the firm is closed. If a hundi is dishonoured for want of funds in the drawee's hands it is returned to the drawer who, if he has drawn it in favour of a person who has paid him the money, must at once pay him off or ruin his business. In most business centres hundies drawn by a firm upon itself or upon its agents in other places, pass through several hands by negotiation and each negotiator together with all who have preceded him including the drawer and the acceptor are liable to the last holder. The greater the number of negotiations (*bechan*) on a hundi the greater the security for its holder. For a hundi which is lost a duplicate (*painth*), and if that is also lost, a triplicate (*par painth*), is given to the holder and the fact of the loss mentioned in both the duplicate and triplicate. The form in which hundies are drawn is that of a letter addressed by the drawer's firm to the drawee's firm, mentioning the place from which it is drawn to the place for which it is drawn, the name of the person to whom it is to be paid, and whether *shah goj* (payable to a respectable person) or *dhani goj* (payable to order). The date is written at the end and it is signed by the person who signs for the firm. In this way business worth lacs of rupees is done in all trade centres every day and it is only when a banker acts dishonestly towards his clients, *i.e.*, draws hundies which he cannot pay, that he fails.

Money-lending.—Most of our money-lenders of the better class seldom draw hundies upon themselves and those who do money-lending seldom deal in hundies to any appreciable extent. They either finance local trade and advance money to well-known firms or shopkeepers on verbal security or on bonds or promissory notes. But of late, on account of the difficulties attending recovery of money through courts, bankers are becoming chary in advancing money upon land. For small loans given to

working classes or agriculturists and payable by instalments, the usual rate is Rs. 12 for every Rs. 10 advanced or the interest may be from one pice per rupee to an anna. Pledges of jewellery are also looked upon as good investments and pawn-brokers charge from 8 as. to 12 as. per cent. per month on gold jewellery and from 12 as. to Re. 1-8 on silver. In times gone by many a village Bohrá who started with a few rupees made his fortune in a few years by financing local agriculturists and landholders. Now also the latter are seldom free from his obligations, but his business is not so paying as it formerly was. A good bank properly and cheaply managed doing all or any of these businesses is however sure even now to flourish. Some of the European banks like the Bank of Bengal, the National Bank, the Allahabad Bank also do what is called the 'cash credit business' advancing 75 per cent. of the value of the goods pledged and charging interest at from 8 to 12 per cent. The goods are stored in the bank's godown and as they are sold from time to time the owner pays the money realized and keeps the profit to himself. Indian bankers also store goods on what is called the Rent and Interest system (*Bejaḥ Bhárá*). In this case, the borrower pays interest *plus* the storage charges and the conditions of the loan are not so stringent as those of the bank. Both these are considered to be safe methods of doing business and are very largely resorted to. In Delhi and other trade centres much of the goods brought from foreign countries are placed with a bank which pays the seller and is in its turn paid as the goods are sold. If Indian agents or *arties* sell goods they charge not only commission and brokerage (*Dalláli and Arát*) but also weighing fees (*Tulai*) and charity money (*Dharmadya*).

The *dharmadya* is generally one anna per cent. and in this way many a charitable institution is supported by Indian trade.

Book-keeping.—All this business is carried on through a system of book-keeping which is very old.

The books kept are—

(i) *Kachi Rokad* or rough cash book for all monies received and paid during the day. It is written up as each transaction takes place and is balanced daily. Small traders use bits of paper stitched together or little boards for the purpose.

(ii) *Pakki Rokad* or the permanent cash book. This is a copy of the rough book and is written up either daily or fortnightly. It is a permanent record and does not enter items settled during the day.

(iii) *Nagal Bahi* or the copy book. This is also a very important book for an Indian banker or trader, as in it is entered every item of receipt and expenditure to be accounted for, as well as all sales and purchases of goods which have not been paid in cash. Sales of goods received from a trader's constituents are entered in the *Nagal Bahi* to the credit of the latter and debit of the purchaser. All hundies drawn are likewise entered in the *Nagal* in the same manner.

(iv) *The 'Rojnámchá'* or the diary is a combination of the *Rokad* and *Nagal Bahi* and is balanced fortnightly and forms one of the most important and reliable books of a firm.

(v) *Khata* or the ledger.—This contains the account of each constituent and branch of the business of the firm and is compiled from the *Rokad* and *Nagal*. It has an account of everything in which the firm is concerned and under each account are entered all items of debit and credit with the date and the page of the *Nagal* or *Rokad* where they are detailed.

All these books must be kept up regularly and accurately in every well conducted business whatever be its nature. In addition to these a firm would also keep a special set of books pertaining to its own particular business. For instance every trader in goods sold by weight will keep a *Tak-putti* (weighment book) where he will enter the

weight and the rate of each bag of grain or other goods sold. A banker will keep a *Hundi Bahi* in which he will copy all hundies drawn. One who deals in goods brought in or sent out will keep an invoice book called *Bilti Bahi* in which he will copy all invoices received or sent out. An *arti* or commission agent will keep a *Mal Bahi* for entering all goods taken out of his godown during the day and a *Jakad Bāhi* in which he will enter all goods sent out on approval. All contracts of sales and purchases of goods are, as they are made, entered in a book called the *Sodā Bahi*. The same is done in the case of *Badmis* or wagering contracts.

The Indian Broker.—The great feature of all Indian business whether of banking or any other kind is its dependence upon *dalals* or brokers whose rates of commission vary from one anna to a rupee per cent. according to the nature of the business done. No branch of business goes without its *dalal*. Some of these men are very reliable and respectable persons and their books are always referred to in disputes about contracts. In Calcutta and Bombay some of the *dalals* are millionaires and they have risen to that from small commissions of one anna or two annas per cent.

Accuracy of Accounts.—A banker's books have always been considered to be trustworthy and even though accounts are now and then forged for the purpose of being produced in courts, yet as a rule the great majority of our businessmen are very particular about the truth and accuracy of their accounts, and those who forge or manufacture them are looked down upon by their fellow-traders. Lacs of rupees worth of business is done verbally and except when people resort to law-courts, even gambling contracts are never denied. These books of account are made from tough country paper manufactured in Muttra. The pages are about nine inches broad and stitched and bound in leather or tough red cloth. Each book comprises from 50 to 1,000 pages and is sold by stationers

from eight annas upwards. A whole set of books for an ordinary business would not cost more than five or six. A new set of books is commenced on each Diwali or Dussehara. But the Indian financial year is from one Diwali to another. The first page of the *Rokah* has, below the *Swastri* mark in red, the endorsement of the writers having worshipped *Mahá-Lakshmi* with a piece of betel leaf put in as a token of the worship.

This is a rough sketch of a system of book-keeping which has come down from centuries and is thought by our men of business to be so perfect as not to admit of improvement. It is certainly more accurate and less complicated than the European system and can easily be learnt by the most ordinary intellect. If men of education would turn their attention to it and master it, they would vastly increase their opportunities of good and useful employment.

Sattas.—A highly objectionable and pernicious feature of our present system of trade is the rapid growth of the *Satta* or *Badai* system which from Calcutta and Bombay, has now found its way into almost all Indian towns. Government paper, grain, opium and silver are the great objects of *Sattas*, which are made under the names of *Souda* or contracts. Neither the seller has or expects to have the goods he professes to sell, nor does the buyer buy nor can he afford to buy the goods he pretends to buy. They are all imaginary goods bought and sold at prospective rates, for certain dates upon which either party pays the other the difference in the market rate and that contracted for; in this way millions of rupees worth of *Sattas* are made by traders and bankers in all commercial centres every hour of the day and when they prove to be beyond their means to fulfil, they land them in insolvency. Cautious and scrupulous traders or bankers never indulge in *sattah*, but unfortunately in Delhi and other places this sort of gambling, especially in opium, is finding its way into the labouring and working classes who in their haste to

become rich lose the little they have got. It is nothing but gambling pure and simple, and if gambling with dice is punishable by law there is no reason why this should not be so. In all commercial centres fortunes are as rapidly made under it as lost and it sets a premium on commercial fraud and dishonesty. It was never current in the olden times and every effort should be made to stop it.

Trades Associations.—The last feature of our banking and other business is the growth in all trade centres of Trades Associations or Chambers of Commerce. Some of these like the Delhi Cloth Merchants' Association takes up the settlement of claims and prevents many a trader from being ruined by suits in the courts. The Marwari Chamber of Commerce in Calcutta is now a very powerful body. Those in Delhi and Cawnpore are also coming to be so. Each branch of trade forms what is called a *panchayat*. But these bodies are effete. If properly organised they ought to regulate all matters connected with their trade. The whole system of modern Indian business, whether of banking or export or import of goods, is entirely dependent upon foreign markets and our merchants and bankers are nothing more than agents of foreign bankers, merchants or manufacturers, depending entirely upon the latter for their rates and supplies. Even by this means many of them are able to earn considerable wealth. But the Indian banker or merchant can be so in the true sense of the term, only when he can control the foreign market, to the extent his own market is now controlled by the foreign banker or merchant. This is an ideal worth striving for by men of education; as much as success in the beaten paths of law, medicine, or Government service. If the training given in English schools and colleges does not fit men for business, there is no lack of opportunity for their being trained in it by other means. But unfortunately, few care to avail themselves of it. If they do so, capital will soon be forthcoming to help them. Experience shows that where-

ever men of education have gone into business and done it with patience and honesty, they have always been successful. The field is still open and if men of no education get rich in a few years, there is no reason why those who are educated should not do so. There are various usages of trade in each place on sales and purchases of various classes of goods. The principal markets are Calcutta, Bombay, Delhi, Cawnpore and Amritsar. In cloth exported from Europe and other places the custom is to deposit Rs. 2,000 with a wholesale agent as security. He allows the depositor interest at 6 per cent. per annum and returns the money when the transaction is closed. Goods are sold by sample sent out by the agent to the buyer who gives him the order of the quantity required and the date on which they are to be delivered. The goods are then shipped to India and the invoice and the bill of lading are sent with a hundi for the amount to a bank in India. This hundi is payable in one month and if the money is paid before a month interest is allowed as discount. As soon as the money is paid into the bank, the latter delivers the bill of lading for the goods sent out. For the goods sent out direct, the period is generally 45 days. If payment is made earlier a discount is allowed. For all bleached and unbleached goods a discount of $2\frac{1}{2}$ to 3 per cent. for woollen goods, 5 to 7 for glassware and ~~10 to 20~~ per cent. for toys is allowed. In cases of goods damaged or not being according to sample, the decision is made by a committee of experts who are mostly Europeans, on deposit of Rs. 53 which is returned if the goods are found not to be according to sample. For purchases of cloth made locally the period of payment is from 45 to 60 days and the rates of discount are from 1-8 to 2 per cent. For cloth manufactured in Ahmedabad, Bombay and Nagpur the period is from 5 to 8 days and the discount from 4 to 8 as. per cent. Most of the cotton sent out from India to foreign countries is sent from Bombay. There the seller is allowed the price of the goods *minus* 500 which is

kept in deposit by the export agent as security in case the goods are sold in the foreign market at less than the price allowed to the seller. If they are, he is paid the deposit after deducting the deficiency. In all local purchases a commission of about Rs. 5-8 per cent., 8 as. for brokerage, 1 anna for Pinjrapol, 8 as. for Dharmadya are charged. If the goods are stored, storage and carriage are added to the above. For metals the usual trade discount is from Rs. 1-8 to 12 as. per cent. Yarn is sold in Bombay at a discount of about Rs. 1-4 per cent. and the period of payment is 5 days. In sales of silver and gold laces made in Agra and Delhi a discount of Rs. 2-8 to Rs. 3-2 is allowed plus 3 tolas extra for every 100 tolas. The system of weights is also different in various parts of India. In some the Government standard weights are used. In others they are much more. For instance in Rohilkhand, the seer is from 95 to 100 tolas and is called the *pukka* seer as distinguished from the standard seer called the *kaccha* seer. In other parts of the country while some of the goods are sold by the standard weight others are sold by higher weight. For instance a maund of cotton in Agra will weigh 1 maund $4\frac{1}{2}$ seers by the standard weight. All these are matters of every day knowledge and should be studied by all who are in business of any description.

THE PROBLEM OF THE INDIGENOUS WORKMAN.

By A. TELLERY, ESQ.,

of Messrs. A. Tellery & Co., Benares.

The Government appointed a Commission to inquire into the conditions of work of labourers employed in factories. These men are free labourers who can shift from one factory to another. They earn handsome wages, are well looked after by their employers, and the Government too are mindful of their welfare. Their working hours are shortened, they are given free medical relief, model villages

are built for their residence, they have a supply of pure filtered water. Contrast this with the condition of the free labourer who works at his own home as of old. The art workman works from 12 to 14 hours a day in his little mud hovel situated in crowded and insanitary streets, has to be content with impure water, is obliged to get on generally without medical assistance. He lives in distress and dies uncared for. The adverse conditions under which he has to work are not studied with a view to their being remedied. The art workman of India has no continuous employment. He does not earn as much as a common cooly sometimes. He lives in bondage to the merchant or middleman who advances money to him in the hour of need, and accordingly is not altogether a free man. He does not pay, as he cannot, interest in coin but has to sell the finished article at a much lower price than it would fetch in the market. And the earnings on the whole are so scanty and precarious that most of the men are generally unable ever to pay back the whole of the advances received by them and regain their bartered freedom. This state of servility is almost a heritage from father to son. The situation at last becomes impossible, and the workman's only escape is migration to big cities and centres of trade like Calcutta and Bombay. Here he comes across old friends and caste-fellows who help him in obtaining work. He is in every way better off in the latter situation as already pointed out and consequently sticks to his new job. It does not take him long to forget his inherited artistic skill. Emigration and labour agents who are abroad take full advantage of the artisan's difficulties and help in his quitting his ancestral calling for serving in other lands for others' benefit. It is thus seen that the artisan in the towns and villages working according to old methods is in much worse case than his brother the factory labourer, and stands in imminent need of all the protection the State and the people can give him. And yet, no Commission sits to enquire into his lot, no thought is given to him in

all the schemes for industrial regeneration. But how *can* there be industrial development without proper heed being paid to the condition of the workman? We should give him some education, equip him with some technical knowledge of his own art or craft, and adopt measures which will enable him to work really as a free man without being the slave of the middleman and the merchant who at present intercept his profits and enrich themselves by his toil.

The Government of India have established a few Schools of Art. I believe there are four of these in British India, besides a few in the Indian States. Now, what have these Art schools done in respect of giving the art-workman a higher training? It would be a most interesting return which would tell us how many workmen were in these schools during the last ten years and received a practical training in the technique of their respective arts which enabled them to turn out superior work. The chief business of an Art school has been to turn out draftsmen to fill some humble places in the P.W.D. and elsewhere. There are very few men passed from an Art school who established themselves as masters or workmen in artistic crafts. Money has been freely spent by the Government on the Art schools, but to what practical advantage is a pertinent question. Not certainly to the good of the indigenous art of India. But have the schools of Art even turned out men proficient in Western Art if we except lithographic printing, etc.? Schools of Art have generally a Show Room for the display of the articles made in the schools. Sometimes however, these rooms are not merely Show Rooms. They are regular shops where articles made in the bazaar are kept for sale to globe-trotters. Thus they compete with private enterprise.

If the Government's efforts to raise Indian Art are to bear fruit, the workman should first be freed from the bondage to the middleman and the merchant, he should be educated and be imparted a training more beneficial

than what he can obtain in the schools of Art. The art workman should be clearly distinguished from the factory labourer. An inquiry should be made into the financial condition of the artisans—what they earn, what amount of work they turn out every month, etc. They should be induced to attend vernacular schools and learn to read and write *Hindi* or *Urdu*. Where men cannot afford to attend classes in business hours, night classes should be opened for their benefit. There should be several such in every city—one in each *mohulla*—and one in every village containing not less than 30 to 50 workmen. After they have learnt to read and write, books written in easy style and dealing with their special subjects should be given to them free of cost.

My second suggestion is that there should be in each province a Technical school at which higher training in artistic and other industries conducted on Western lines will be imparted. How far Western methods may successfully be employed in the improvement of Indian Art, which has fallen to a low state indeed at present, should be studied in these schools.

The demand for Indian artware in foreign countries is on the increase while the demand of the Indians themselves is small. Imported artware, fancy goods, etc., find ready purchasers in Indians. These are of nice finish, are useful for the purpose intended, and are much cheaper than Indian articles of the same description. As the combined demand from within the country and from foreign lands for Indian artware is not large enough to provide occupation for all the labourers of the country, other industries must be started to absorb the remainder of them.

There are no openings for all the men who leave colleges and schools as passed or failed men. They are intelligent men who could earn a decent living at some useful trade or industry if their education had not been so one-sided and literary. Face to face with poverty, family obligations, their caste requirements, and an increasingly

keen struggle for existence, and withal with no means open to them of earning their livelihood, the lot of a middle class Indian is as pitiable as that of the humbler toiler in the field and the cottage. By all means give the youth of India literary education, but equip them too as an essential part of their education with some amount of mechanical training, and give them opportunities of becoming not only lawyers and public servants, but masters, foremen, assistants, etc., in works.

I suggest that committees be appointed in every province to go thoroughly into this Industrial question and prepare schemes of work which can be carried out. These may be laid before the Government, and with their co-operation and encouragement work may be taken in hand in right earnest.

THE GOVERNMENT AND INDUSTRIAL DEVELOPMENT.

BY N. PATTABHIRAMA RAO, ESQ.,

Retired Dewan of Cochin, Madras.

India is an agricultural country and nearly three-fourths of her population depend on agriculture as their main industry. Vicissitudes of season affect agriculture more in this country than elsewhere and this as well as his ignorance and unbending conservatism has brought the Indian ryot to a state of impoverishment which leaves him very little of staying power and he is consequently thrown on the chance support of his neighbour's generosity or relief by Government at the least disturbance in the ordinary run of a season. The several artisan classes who form the major portion of the rest of the population make their living by handicraft but they find themselves being beaten into non-existence by the overwhelming competition of machine power. Under such conditions it is incumbent on those who are responsible for the well-being

of the people to devise means for the amelioration of their condition. Constituted as the British Indian Government is, its responsibility in regard to matters concerning the well-being of the population is much greater than in the case of a Government in which the people have a voice in the management of the public revenue and the framing of its fiscal laws. The Indian Government is therefore peculiarly situated in this respect and it is incumbent on it to interest itself more directly and actively in matters in which under other circumstances the initiative need not necessarily proceed from that source.

There are two main directions in which endeavour should be made for promoting the development of industries. One is the improvement of indigenous industries and the other the creation of facilities for the introduction of new industries. To bring about the former the first step to be taken is to take stock of existing local industries. The next is to select such of them as are deserving of encouragement and lastly to subject them to investigation and study so as to discover what their weak points are and how they may be remedied. The industrial classes are unfortunately all ignorant and their circumstances and environment have for some time past been such that they do not conduce to their working themselves out of their present condition by any efforts of their own. The intellectual and the moneyed classes have not learnt to look upon improvement of industries as any business of theirs : add to this the advance other countries have made in the development of their industries the situation has been rendered for individual effort. In circumstances like these it becomes the duty of Government to step in and do the needful for helping the country's industrial development. The attention of the Government of India was drawn to this aspect of the situation nearly thirty years ago and since then enquiries in this direction are being made by the several Provincial Governments and administrations so that much information

has been collected and a mass of literature has been written on the various industries on which people are engaged in different parts of the country. Latterly, the necessity for examining the information thus collected and evolving out of it some practical measures for adoption has got to be recognized and as a result conferences consisting of persons interested in the subject were convened by some Governments and the needs of the province concerned fully considered and threshed out. The Conference convened by the Madras Government at Ootacamund in September last was of opinion that Government should render help in the following directions :—

(1) Creation of a special department under a special officer to deal with industrial questions and control industrial instruction and technical education. This department will give advice in regard to new industries and the introduction of new methods and processes. It will also carry out investigations and experiments and develop selected industries.

(2) Offering substantial rewards for inventions likely to be of important industrial advantage.

(3) Encouraging exhibitions and offering liberal prizes for products, methods and appliances.

(4) Disseminating through the Press both in the English and the Vernacular languages information regarding new industries.

(5) Arranging for lectures on industrial subjects accompanied where possible by practical exhibitions of products, appliances or improved methods.

(6) Making grants or presents, or loans of machinery for particular industries.

(7) Undertaking as a pioneer under certain conditions the introduction of new industries or industrial processes for the purpose of training students or apprentices or for demonstrating that such industries will be commercially successful.

(8) Forming a bureau of information and an indus-

trial museum from which information could be obtained on points of commercial importance and interest.

(9) Expanding the local College of Engineering into an Institute of Technology with complete laboratory and workshop equipment and establishing industrial schools at centres where connected industries are carried on.

(10) Awarding scholarships to enable young men to proceed to other parts of India for receiving technical education.

The above are the main lines on which the Conference indicated that Government should formulate its policy in regard to industrial development. Some difference of opinion however exists in regard to the desirability of Government pioneering industries even were it for the purpose of introducing new industries and demonstrating their commercial value. The chief objections put forward to Government pioneering an industry are :—

(1) Sound industrial development can only be secured by private enterprise.

(2) State industry is unfair to the tax-payer who will have to bear all losses.

(3) Private enterprise will suffer as it cannot compete with Government institutions provided with unlimited capital at low rates of interest.

(4) Flootation of companies by Government is undesirable.

(5) The proposal to start industries and hand them over as going concerns is a very dangerous one for the new proprietors without the experience gained in building them up from small beginnings would almost inevitably come to grief.

(6) Technical education and experiments should not be carried further than the laboratory or model institute and industrial instruction should not go further than the industrial school.

The Government of Madras in dealing with the above objections have remarked as follows : " His Excellency the Governor in Council recognizes as a general principle that the exploitation of industries should be regarded not as a normal but as an exceptional function of Government, and on the general question of limitations that should be set to the functions of the State in attempting to promote industrial development, His Excellency in Council has no hesitation in accepting the conclusions arrived at by the Conference. With the restrictions which the Conference has laid down, the Government are convinced that private enterprise has nothing to fear while it may have much to gain from the association of the State in the work of promoting the industrial development of the country."

The restrictions laid down by the Conference referred to in the above extract are :—

(1) No such undertakings should be engaged in by the Government without prior consultation with an Advisory Board upon which Indian interests and the leading commercial and trading interests in the Presidency should be represented.

(2) No such undertaking if used for demonstrating any process as commercially successful should be engaged in unless after careful enquiry the Government arrives at the conclusion that it is one in which private enterprise does not already exist nor is willing to venture.

(3) It should be a principle of such undertakings that the fullest possible publicity should be given by the periodical publication of reports and by a full statement of the accounts of the undertakings.

(4) Looking to the principle that such undertakings, if used for demonstrating that any process is commercially successful, should be directed to the assistance of private enterprise, it should be a rule that Government should withdraw from any such undertaking as soon as it is clear that it has sufficiently demonstrated the advantage of improved methods of working in that particular industry.

The objection to State intervention with industries is no doubt a sound one if that intervention were to lead to State industrialism. Private enterprise will in such a case find it difficult to compete with a powerful rival like the Government and consequently will be smothered if not totally killed out. But for reasons stated above, active interest on the part of the Government is necessary for the development of industries in this country and with the restrictions imposed by the Ootacamund Conference, State intervention will but take the form of State co-operation, a condition of things which every one who has the welfare of the country at heart should heartily welcome.

It is gratifying to observe that the Madras Government have already adopted the recommendations of the Ootacamund Conference in regard to the creation of a special department under a Special officer to deal with industrial questions and the formation of a bureau of industrial information and an industrial museum. They have also ordered the formation of local industrial committees and directed the special officer to prepare lists of industries with a view to the establishment of industrial schools in relation to them. The Weaving industry and Leather-tanning have also received special attention and the Special officer has been directed to send up also proposals for the employment of an expert in dyeing and for offering of rewards for a suitable oil-extracting plant. They have also ordered that proposals should be submitted for the constitution of an Advisory Board for the consideration of the condition of chemical industries of the Presidency. Thus it will be seen that the Madras Government have already taken action on the recommendations of the Conference and have in this manner practically indicated their sense of responsibility in the matter of promoting the industrial activity of the Presidency. The Bombay Government have organised a series of lectures on commercial subjects by an expert brought down specially for the purpose from England. While this gentleman is still in this

country the Madras Government will, it is hoped, avail themselves of the opportunity by inviting him to deliver a series of lectures in this city also.

Apart from the question of promoting the developments of existing industries with a view to finding employment for the declining agricultural and artisan classes there is the higher consideration of developing industries with a view to enable the country to hold its own in its trade competition with other countries in the world. This can be effected only by educating the people in mechanical arts and the application of higher scientific knowledge to arts and industries. For, in the race of world's progress the other countries have called in the aid of mechanical power supported by steam and electricity for carrying out their industries. The Ootacamund Conference has urged the necessity of expanding the Madras Civil Engineering College into a Technological Institute and it is quite possible that within a measurable distance of time this will become an accomplished fact. Similar suggestions have been made in the other provinces also which are also likely to be given effect to at no distant date. The establishment of these technological institutes alone will not however make the people experts in sciences and their practical application to arts and industries. A taste for scientific learning and practical work must be created in our younger generation so that when they reach the collegiate stage they may readily take advantage of the instruction afforded by the several technological institutes. The present system of education is not conducive to the growth of a taste for manual work and consequently it is necessary to modify the system so as to include in it a course of manual training from the beginning. The Ootacamund Conference strongly desired to urge this in their recommendations but were able to carry through only a resolution in favour of introducing compulsory manual training including the use of tools in the curriculum of studies of only *Secondary* schools for males. The introduction of compulsory manual train-

ing in the curriculum of studies from the beginning, *i.e.*, in the *Primary* classes will train the mind to look upon this branch of study with favour in the later stages and not with aversion as will be the case if begun late. Under this system all need not qualify themselves for mechanical industries but at a certain stage, say at the end of the secondary course—it may be even at its beginning—one may specialize his course of study either in mechanics, science or literature.

There are some who consider that industrial instruction must follow the establishment of industries. But in this country where it is hardly possible to bring industries into existence owing to the want of the skilled labour requisite for starting them, the result will be disastrous if the imparting of industrial instruction is made to wait till the industries are started. It is like waiting to get into water until learning the art of swimming. For starting an industry there must be one with the requisite knowledge available. No one will assert that this country is lacking in resources for giving sufficient work to a capable hand. Nor can it be said that capital will be wanting if those in possession of capital are assured that a capable hand is available to whom it may be profitably entrusted. What is wanting is technical knowledge and the active help of Government is necessary for bringing this into existence. A stage has now arrived when it is incumbent on Government to shape its educational policy so as to give prominence to manual and mechanical instruction in the curriculum of general studies and it is strongly urged that Government will give its serious consideration to this important subject.

AGRICULTURAL IMPROVEMENTS IN THE CENTRAL PROVINCES.

BY D. CLOUSTON, ESQ., M.A., B.Sc.,

Deputy Director of Agriculture, Central Provinces, Nagpur.

As an introduction to this paper on Agricultural Improvements in the Central Provinces, I cannot do better than quote from a similar paper written by me for the *Agricultural Journal of India*, Volume III, Part II.

'Government has organized during the past few years a strong Department for the scientific investigation of Indian agriculture, with the object of ascertaining the lines upon which improvement is practicable. A staff of specialists highly trained in the agricultural sciences is employed both in the Imperial and Provincial Departments whose research and experimental work have already shown that many important improvements can be effected. These results are placed before the public in the reports and other publications issued from time to time, but such literature fails to reach the mass of Indian cultivators. It is, therefore, an essential function of the Department, no less important than scientific investigation, to devise methods whereby experimental results of proved value can be introduced into ordinary farming practice by the Indian cultivator. The methods to be employed in bringing experimental work of proved value to the notice of cultivators so as to secure its adoption in ordinary farming practice, will necessarily vary in different parts of India in accordance with the varying local conditions such as the system of land tenure, the standard of farming attained by the cultivators, the social condition of the rural community and the like. It may be of interest to give an account of the methods that have been tried in the Central Provinces, and of the lessons learnt from the successes and failures that have resulted.

'In the Central Provinces, the villages are held by landowners, whose proprietorship is clearly recognised, though their rights of ownership are subject to the rights of occupancy of their tenants. Both proprietor and tenant are given security of tenure in the land, with the object of encouraging each to make the best possible use of it. This system has given a number of village proprietors who often cultivate large home-farms, intelligent farmers who are willing to test improved methods and to lay out substantial capital sums, if they are convinced that an adequate return is likely to be secured. Amongst the tenantry there is also a sprinkling of men who cultivate large holdings and employ large capital; and such men are even more numerous in the rich province of Berar where the ryotwari system of tenure prevails. The difficulties in introducing improvements are, therefore, not so great as in a tract where the land is parcelled out into minute holdings and where the capital at the disposal of each holder is extremely limited, for there are numbers of cultivators ready to expend

some hundreds of rupees upon a new implement, an improved method of cultivation or the like, provided they are convinced that the outlay will give a substantial return. The standard of farming attained in different parts of these Provinces varies considerably but it is on the whole inferior to that of most other parts of India, so that there is much more scope for improvement than in provinces where cultivation has already reached a high level. In the Central Provinces, as a rule, land is plentiful and intensive cultivation is but little practised; in Berar, on the other hand, the great boom in the cotton trade has enormously increased the demand for land, with the result that grazing areas have been curtailed and the standard of cultivation has reached a much higher level. Good cultivators are found, as exceptions, among all the different castes. The best cultivators are the hereditary cultivating castes such as Kunbis, Powars and Lodhis. Contrasted with these may be mentioned such castes as Gonds and Chamars. The former live a contented but an unenterprising life in hilly jungle tracts of poor soil. Satisfied with a low standard of comfort they are for the present so inaccessible and primitive as to be altogether outside the sphere of the department's influence. The Chamars who form the bulk of the cultivators in the Chhattisgarh rice country, though inferior cultivators, enjoy a lazy and stoical content which is opposed to everything an Agricultural Department can teach in the way of progress. Contrasted with these again may be mentioned the educated Brahmin cultivator of Berar who, after having made his fortune at a profession or trade, has purchased land on which he is anxious to experiment with anything from tree cottons to steam ploughs. The kind of improvements necessary, and the lines to be followed in introducing them among cultivators, can only be satisfactorily determined after studying all these conditions as they obtain in the different tracts. In the more backward parts, it is often some means of demonstrating better tillage methods that has to be considered; the Chhattisgarhi, for instance, has yet to learn the very elements of his art, i. e., to cultivate his land properly, to conserve the manure already at his disposal, and to sow his crops efficiently. In more advanced tracts, on the other hand, what is necessary is to organise a system of seed farms from which supplies of pure and improved seed can be obtained, to introduce new and improved varieties of seeds, to teach definite but simple methods of preventing and remedying insect pests and of supplementing the present supply of manure. Every scheme for demonstrating the results of experimental work to the ordinary cultivator must, then, be based on a knowledge of the different tracts and of the people and their needs.

Though the work of introducing improvements in these Provinces is but in its infancy, a very good start has been made and it is almost certain that progress will now be very rapid. There are many incentives to good work; the Local Government is most anxious to do everything with-

in its power to further the interests of the ryot ; the ryot himself, though often poverty-stricken is so patient and uncomplaining in the midst of his hardships, and so grateful for help received that the scientific worker among them cannot help feeling that it is his bounden duty to minister to the wants of this most deserving class in every way possible. The ryots of these Provinces are now beginning to appreciate the work that is being done for them and to regard the Department as their friend. Of the work that has now been going on for some years, that of distributing good seed and improved implements is among the most important. There are now eight cotton seed farms in the cotton tract, from which seed of the different varieties of the indigenous cottons is distributed to cultivators. Seed of new varieties that have been tested at the Experiment Stations is also tried on these farms, so as to ascertain how far the new variety is suitable for the soil and climatic conditions of the different parts of the country in which these farms are situated. These cotton seed farms have been successful and in some cases cultivators have started to grow cotton for seed on similar lines. The aim of the Department is to encourage private enterprise and to get one or two seed farms established in each tahsil of the cotton tract, and managed entirely by the owners—the Department merely supplying the owner each year with specially selected seed from the Experiment Stations. The Department is in close touch with the owners of these farms, and they are inspected from time to time by its officers who advise their owners as to the lines on which they should be run. The owner is encouraged to inspect the Experiment Station of his tract and to see the whole scheme of seed selection as carried out thereon.

The scheme for the improvement of cattle as carried out on the two cattle-breeding farms is based on the same principle as that for the improvement of seed. Two herds of cattle are kept for breeding purposes, and for the last three years bulls have been given out on loan to cultiva-

tors desirous of improving their breeds. Arrangements are also being made to sell some bulls and heifers bred on these farms to cultivators, who are willing to buy and use them for breeding purposes.

The introduction of improved implements has also been a boon to many cultivators in these Provinces. Winnowers for cleaning grain, fodder cutters for cutting juar stalk, pumps for irrigation, iron ploughs for the cultivation of black cotton soil have proved most useful and are now in common use in many districts.

The use of copper sulphate as a fungicide for smut in juar has been widely demonstrated in the juar tract and is now practised by many of the leading cultivators of that tract.

Purely scientific work as carried out at the Experiment Stations is still in its infancy, as there was no trained body of scientific workers in the Department till lately. In this respect we compare but poorly with Bombay and Madras which have long had their European experts in the field. Of the work that has lately been taken up on scientific lines, the classification of the principal crops, the plant-to-plant selection of seed, improved methods of conserving farm-yard manure and the introduction of improved methods of cultivation in backward tracts are among the most important. It would be hard to calculate the pecuniary value of these results. It has been proved that by adopting the dry-earth system of conserving cattle urine, which is now strongly recommended to cultivators, and which has already been adopted by some, the value of a farmer's available supply of manure can be almost doubled and at a very small cost. The classification of the cottons has enabled the department to grow separately the four distinct types which constitute the so-called *jari*; and it has been found that the best of the four, namely, *Malsensis*, if grown pure, is worth a considerable sum more per *khandi* than the mixture grown at present. The Department hopes to establish the cultivation of this profitable type.

Of new varieties of crops which have been found suitable to the climatic conditions and preferable to those already in use, *Buri* cotton from Bengal, groundnut from Madras and thick varieties of sugarcane from Bombay and Madras are worthy of mention. To get all these introduced on a very large scale is now but a question of time.

The work of introducing new and improved methods of cultivation, more especially the transplantation of rice and the irrigation of wheat and rice in Chhattisgarh, has been the most successful of all the Department's undertakings. In Chhattisgarh, which is the most backward division in these Provinces, out of 2,830,074 acres of rice, 37,878 only are transplanted, or 1·3 per cent. Though the Chhattisgarhi cultivator is more dependent than any other in the Central Provinces in irrigation, he is only now beginning to appreciate the value of water as a factor in increasing his crop. Before the advent of demonstration farms run by the Agricultural Department, the Irrigation Department had made little or no headway in getting cultivators to utilize the water of Government tanks, of which there is now a large number in this Division. This work has now been taken up in earnest by the Agricultural Department, demonstration farms have been started under the principal tanks and the advantages of irrigation have been demonstrated with great success. This unenterprising class of cultivators is also being induced to transplant their rice instead of sowing it broadcast as done at present. By experiments conducted at the Raipur Station it has been proved that by transplanting and irrigating his rice the cultivator can increase his farming profits by Rs. 24-6 per acre over that of the ordinary outturn obtained from this crop when sown broadcast. As the result of its demonstration work in this division during the last year, the Department has induced the cultivators to transplant about 1,300 acres of rice and to irrigate 800 acres of wheat, where the transplanting of rice and the irrigation of wheat were quite unknown before. That these

improvements will be generally adopted, and that the profits of the farming community of this tract will go on increasing enormously is certain. The introduction of the better varieties of sugarcane in the tank-irrigated areas of this tract is at present being pushed and will in a few years add very considerably to the wealth of this part of these Provinces.

Not the least important of the improvements introduced by the Department is the intelligent interest in farming which it has awakened among cultivators in these Provinces. This is a most pleasing and satisfactory feature of its work. Its *Agricultural Gazette* started five years ago has now a circulation of over 6,000 copies a month. The Raipur Experimental Farm which is in the most backward part of the Province was visited last year by over 4,000 cultivators interested in our work. The confidence of the cultivators in the Department, their interest in the work of the Experiment Stations and requests for information and advice are daily increasing. This is very largely due to the success of the demonstration work of the Department of late years, and to the close personal intercourse that now exists between some of its officers and leading cultivators. The various District Agricultural Associations have been the medium through which much useful work has been done. It is commonly noticed now that malguzars are taking a more active and more intelligent interest in their own cultivation, are keener to incorporate into their farm practical improvements recommended to them, and that their confidence in the Department is steadily growing. These in short are the lines on which the Department is attempting to fulfil its function in these provinces. There are many difficulties in the way of progress and our staff of workers is small, but supported by a most sympathetic Government, and confident of the fact that the average ryot is capable of appreciating and applying better methods of cultivation when he sees that it serves his interest to do so, I believe that the Department of Agriculture in the Central Provinces has before it a great future.

IRRIGATION BY PUMPING.

BY ALFRED CHATTERTON, ESQ., B.Sc.,

Director of Industries, Madras.

One of the many difficulties which have to be faced, by those who are striving to improve the economic situation in the South of India, is the high price which has to be paid for fuel, owing to the fact that nowhere south of Singareni in the Hyderabad State has coal been found to exist in workable deposits. The few possible sites, where water-power can be obtained, are in remote and almost inaccessible situations, and the time has not yet arrived for the vast schemes which must be worked out to enable such of those natural sources of power as we possess to be utilised. Much must be done before a rival can be set up to the great electric system of power distribution which the Mysore State has created within its own territory. There are no great engineering difficulties to be faced, and the generating stations could be set up cheaply enough. The difficulties are due to the lack of industrial organisation and the petty nature of the widely scattered demand for power which would render the cost of distribution prohibitive. Under these circumstances the internal combustion engine, which has lately been brought to such a high degree of perfection, has proved an ideal source of motive power. Within the last year or two, hundreds have been purchased and are now supplying power for pumping water for irrigation, for the water-supply of towns, for drainage works and for driving rice hulling machinery, oil mills, coffee pulpers and tea-making machinery. For a variety of miscellaneous purposes they are also employed, but in the main for those already specified.

So long as liquid fuel is available at somewhere about the present prices the ordinary type of oil engine is the most convenient form of internal combustion motor to employ for small powers, but for units of over 20 H.P., especially in the neighbourhood of forests where timber is

cheap and charcoal can be manufactured in large quantities, the suction gas producer plants are unquestionably superior ; whilst in special cases, where very large amounts of power are required, the Diesel form of oil engine working with liquid fuel furnishes the most economical motor at present available. Kerosine oil is too expensive a fuel to employ in oil engines and the continuance of the supply of liquid fuel at the present prices, or in fact at any reasonable price at all, is by no means a certain matter. It is therefore desirable that as far as possible efforts should be made to extend the field in which suction gas producer plants can be employed with advantage. It is important to remember that the charcoal they need is a local product, an extensive demand for which would greatly benefit the very large areas of reserved forest in this Presidency. It would, I think, be almost a fatal error to build up an industrial system in Madras based upon foreign sources of fuel supply and the oil engine should be regarded as a temporary expedient which must ultimately give place to engines using gas. Obviously therefore we, in Madras, should devote ourselves to the introduction of suction gas producer plants and the improvement of the methods by which the wood in our forests and plantations may be converted into charcoal and the various bye-products for some of which there is a considerable demand. The destructive distillation of wood is a chemical industry of considerable importance in other parts of the world where the natural facilities for carrying it on are no greater than those which exist in the south of India. For more than a year past, it has therefore been the subject of detailed study and investigation with very promising results. Unfortunately it is a highly specialized industry of which we possess no experience in this country and if it is to be worked with commercial success it must be started on a large scale. The inquiries made out here must therefore be supplemented by further investigations in Europe and America before it can be definitely stated that it would be wise for private enter-

is for two reasons : (1) Many of the owners of engines and pumps are averse to giving any information regarding them as they fear it may be subsequently used to their detriment whenever the next revision of the settlement occurs, and (2) others, and they probably form the majority of pump owners, see no necessity for keeping accurate accounts, and as no small part of their transactions are still in kind it is difficult to get at the real facts. However, they express themselves satisfied with the working of their engines and pumps and their neighbours are following their example, so that it may be concluded that they have done well by themselves. Already the number of pumping stations is so large that it is impossible to keep in touch with them all and I am unable to supply any accurate summary of the work which they are doing. The total horse power is over 1,200 and the total capacity of the pumps nearly five million gallons per hour. If our estimates regarding the quantity of water which should be supplied to dry crops are at all accurate this volume of water for ten hours per day would suffice for the irrigation of about 11,000 acres, but it is quite certain that the actual area irrigated is far below this figure. This is partly due to the fondness of the ryot for cultivating paddy which requires a very large quantity of water but from which, at the present prices, he derives considerable profits even when the water has to be lifted by an engine and pump. It is probable that about 5,000 acres are irrigated by engines and pumps and the whole of this area is either double cropped or devoted to the cultivation of such crops as sugarcane, plantains, and turmeric which remain on the ground throughout the whole year and which yield very large returns.

From the details of cultivation furnished by the owners of pumping plants and carefully scrutinized by my Supervisors, it will be seen that the irrigators are inclined to adopt a very intense system of cultivation and that as a rule the gross value of the crops per acre is seldom less

than Rs. 100 and often a great deal more. The necessity for artificial manures has been forced upon the attention of the cultivators and a good deal of experimental work is in progress to determine the best way of preventing the exhaustion of the soil. There is a tendency to use too much water, a mistake seldom made when it has to be lifted by cattle power or by men working picottahs. This is due, in most cases, to the owners of wells being able to obtain more water than they really require for their land and the remedy will probably be found in the more extensive adoption of the system of selling water which is already being introduced. The owners of most of the pumping stations are intelligent and energetic men with capital at their disposal, and any assistance which can be given them by the Agricultural Department is likely to prove labour well spent and to be productive of good results.

The following notes regarding the working of a number of installations have been compiled by my Supervisors from information supplied to them by the owners of engines and pumps. The data have been carefully checked and I think they may be regarded as sufficiently accurate for practical purposes. In very few instances have any records been kept of the number of hours the pumps were at work so that the figures regarding the cost of working afford no information as to the actual cost of lifting water. In almost every instance it will be seen that the cost of lubricating oil is a very large percentage of the cost of running the engine and there is reason to suspect that in this direction there is considerable waste. This is counterbalanced, however, by the low cost of wages :—

(1) Installation of a $7\frac{1}{2}$ H.P. engine and 4" pump at Kalinjikuppam. This was put down by M. R. Ry. V. Desikacharri, a retired pleader at Tiruvendipuram in the South Arcot district. The well is 20 feet in diameter and 26 feet deep, and it irrigates 18 acres of land which was

formerly dry. Dealing with the year ending September 1908, 8 acres of paddy were grown between October and March and the value of the crop was Rs. 270. A second crop on the same land between May and August yielded Rs. 480. Groundnut and ragi were grown on 10 acres between January and July. The groundnut crop was worth Rs. 1,000 and the ragi Rs. 500, the total value of the crops during the year amounting to Rs. 2,250. The working expenses of the engine amounted to Rs. 552-8-0 made up as follows :—

	RS.	A.	P.
Liquid fuel	360	0	0
Wages of driver at Rs. 6 a month	72	0	0
Kerosine oil	24	0	0
Lubricating oil	90	8	0
Repairs	6	0	0
Total	<u>552</u>	<u>8</u>	<u>0</u>

No accurate figures have been furnished regarding the cost of cultivation, but the following estimate is probably not far short from the truth :—

	RS.
Each paddy crop at Rs. 20 per acre ...	320
Cost of groundnut cultivation at Rs. 40 per acre	400
Cost of ragi cultivation at Rs. 25 per acre	250
Total	<u>970</u>

The total working expenses were therefore Rs. 1,522-8-0 and the profit Rs. 727-8-0. The cost of the installation was Rs. 3,065.

(2) Installation of a 5 B.H.P. engine and 3" pump at Panamkuppam belonging to M.R.Ry. Srinivasa Gounden.

The water-supply is derived from a well 9 feet in diameter and 20 feet deep and the area cultivated is 20 acres of land which was formerly dry. The whole area has been leased to ryots at a rental of Rs. 75 per acre and the net yield to the proprietor is Rs. 1,500. His son drives the engine and the expenditure during the year was Rs. 250. Allowing Rs. 10 a month as the value of the services of the driver the gross profit on the installation amounted to Rs. 1,130. This is a very good return on the capital cost of the installation which amounted to Rs. 1,707.

(3) Installation of a 9 B.H.P. engine and 4" pump at Nellikuppam belonging to M.R.Ry. S. Tilla Govinda Gramini. The well is 20 feet in diameter and 18 feet deep and derives its water from a bed of coarse sand. The water-supply is more than ample, as the area under cultivation is only 15 acres. From March to July the whole area was under groundnut and from September to January under paddy. The value of the groundnut crop was Rs. 2,625 and of the paddy Rs. 1,575 making a total of Rs. 4,200. The cost of working the engine amounted to Rs. 683-1-4 made up as follows :—

		RS.	A.	P.
Liquid fuel	...	318	15	4
Lubricating oil	...	138	2	6
Kerosine oil	...	47	7	6
Repairs and belting	...	58	8	0
Driver's wages	...	120	0	0
Total	...	683	1	4

Cultivation expenses amounted to Rs. 513-12-0 for the groundnut crop and Rs. 597-3-0 for the paddy crop. Against a gross yield therefore of Rs. 4,200 the expenditure amounted to Rs. 1,794-0-4 and the gross profit to Rs. 2,406. The cost of the installation was Rs. 2,750.

(4) Installation of a 7½ B.H.P. engine and 4" pump belonging to Mr. Balagurumurthy Chetty at Punjerikup-

pam. The well is 17 feet in diameter and 23 feet deep and the area under cultivation is 23 acres. Fifteen acres were under groundnut and subsequently under ragi, 5 acres under gingelly and 3 acres under paddy. The value of the crops grown was as follows :—

			RS.
Groundnut	...	...	2,280
Ragi	...	...	720
Gingelly	...	...	155
Paddy	...	...	450
			<hr/>
Total	...	...	3,605
			<hr/>

No accounts were kept of the cost of running the engine or the agricultural expenses, but they may be estimated approximately as follows :—

			RS.
Engine	...	...	600
Groundnut crop	...	...	600
Ragi	...	...	375
Gingelly	...	...	40
Paddy	...	...	120
			<hr/>
Total	...	...	1,735
			<hr/>

This leaves a gross profit of Rs. 1,870. The cost of the installation was Rs. 3,200.

(5) Two installations belonging to M.R.Ry. S. Panduranga Mudaliyar of Cuddalore, one a 9 B.H.P. engine and 4" pump and the other a 9½ B.H.P. engine and 4" pump. Each of these installations works on a well 36 feet deep from which a certain amount of water is derived by percolation, but the main supply is derived from beds of sand in which the water exists under sufficient pressure to rise to within 15 feet from the ground. In both the wells the borings are lined with a 7" pipe, sunk in one case to a depth of 84 feet from the ground level and in the other to a depth of 58 feet. The total area under the two install-

ations is 48 acres and during the year the following crops were grown :—

Crop.	Area.	Cultivation expenses.	Value.
	ACS.	RS. A. P.	RS. A. P.
Paddy	10.22	201 0 0	535 0 0
Plantains	2.75	202 8 0	688 0 0
Sugarcane	4 28	430 14 0	192 0 0
Groundnut	6.15	348 0 0	701 0 0
Ragi	9.83	252 0 0	240 0 0
Groundnut	11.83		1,348 0 0
Groundnut	2		220 0 0
Gingelly and Indigo ...	15.48	131 12 0	80 0 0
Ragi	3	76 0 0	216 0 0
			135 0 0
Total ...	..	1,642 2 0	4,355 0 0

The working expenses of the two engines were Rs. 904 made up as follows :—

	RS.
Liquid fuel	440
Lubricating oil	148
Kerosine oil	40
Driver's wages... ..	204
Repairs and belting	72
Total	904

The gross profit amounted to Rs. 1,808-14-0 whilst the capital cost of the two installations was Rs. 7,000.

(6) Installation of a 9½ B.H.P. engine and 6" pump belonging to Government and leased to M.R.Ry. V. Subramania Aiyar of Panampet near Villupuram.

The water is derived from a tank 60 feet square and 18 feet deep. The pump is mounted on a well 8 feet in diameter and 26 feet deep at the edge of the tank. The land under irrigation belongs to the ryots of the village and they buy the water-supply from the pump, paying for it at the rate of 11 annas per hour. The area irrigated

during the year was 70 acres, which from January to June was under ragi and groundnut together; whilst in July, August and September 50 acres were under kambu and 20 acres were under thenai. It is only possible to form an approximate estimate of the value of the crops :—

			RS.
Ragi	...	...	2,240
Groundnut	...	...	6,300
Kambu	...	...	750
Thenai	...	...	825
Total			<u>10,115</u>

From January till the end of August the engine worked 2,323 hours as follows :—

			HOURS.
January	...	...	153
February	...	...	235
March	...	...	305
April	...	...	481
May	...	...	540
June	...	...	382
July	...	...	183
August	...	...	44
Total			<u>2,323</u>

Assuming the average discharge of the pump was 25,000 gallons per hour, the duty of water obtained in April and May was 95 acres and 84 acres per cusec. This low duty is mainly due to the porous character of the soil, which is a light loam overlying a bed of coarse sand.

The working expenses amounted to Rupees 1,018-1-6 made up as follows :—

		RS.	AS.	PS.
Liquid fuel	...	492	15	0
Lubricating oil	...	104	8	0
Kerosine oil	...	28	6	3
Driver and Watchman	...	184	0	0
Repairs and belting	...	208	4	3
Total		<u>1,018</u>	<u>1</u>	<u>6</u>

The income by sale of water was Rs. 1,534-9-0 and the net profit to the lessee was Rs. 516-7-6. The cost of this installation was about Rs. 5,000, so that selling the water from the pump at 11 annas per hour was not a very profitable transaction and the price charged would probably have been much higher had not the installation been handed over to the lessee free of rent for a period of three years as an experiment. On the other hand the ryots benefited very considerably as is shown by the demand for water which in May necessitated running the engine for 540 hours. At first ryots were very averse to running their engines more than seven or eight hours a day and entirely opposed to running them during the hours of darkness, but already where the water supply permits of it the engines are run day and night whenever necessary.

(7) Installation of a $7\frac{1}{2}$ H. P. engine and 4" pump belonging to M.R.Ry. A. Venkatasubba Reddiar, Arukilavadi village, near Arkonam. The water is derived from a well 10 feet in diameter and 20 feet deep. The total area under cultivation during the year including second crop was $41\frac{1}{3}$ acres yielding the following return :—

			ACS.	RS.
Paddy	...	...	20	1,291
Ragi	...	...	5	280
Groundnut	...	...	8	300
Gingelly	...	...	6	220
Plantains...	...	...	1	100
Garden produce	...	...	$1\frac{1}{3}$	70
				<hr/>
Total	...	...		2,261
				<hr/>

The cost of cultivation amounted to Rs. 760 and the working expenses of the oil engine to Rs. 568, leaving a gross profit of Rs. 933. The cost of the engine and pump was Rs. 2,535.

This plant was procured on the hire-purchase system and the owner has paid three instalments out of the four without borrowing money, and it is stated that he contemplates purchasing a second installation as soon as the payment on the first has been completed.

(8) Installation of a 5" pump and a 12 H. P. engine belonging to M.R.Ry. Govindaswami Nayudu of Natham near Gudiyattam. The pump is located in a well 20 feet in diameter and 16 feet deep, and in the bottom an inner well 14 feet in diameter has been sunk. The cost of the installation was Rupees 3,100 and previous to its erection sixteen pairs of cattle were kept. The engine and pump enabled the owner to dispense with ten pairs of cattle which he sold and realised Rs. 1,500. The working expenses of the engine and pump averaged Rs. 80 a month and the following returns so far have been received :—

			ACS.	RS.
Paddy ...	...	...	12	1,200
Ragi ...	...	...	2	100
Cocoanuts	...	...	13	400

The cost of keeping sixteen pairs of cattle is stated by Mr. Govindaswami Nayudu to be Rs. 240 per month or Rs. 15 per pair. The saving effected by dispensing with ten pairs of cattle is Rs. 150 per month against which must be set the cost of the engine, about Rs. 80 per month. Apart from the fact that he has now a much better water-supply, a net saving of Rs. 70 per month is effected equal to Rs. 840 per annum, which is 50 per cent. on the net expenditure incurred after allowing for the value of the cattle which were sold.

(9) At Mèlròsapuram, which was the first pumping installation started, there is a 3½ H.P engine and 3" pump raising water from a well. During last year the Rev. Mr. Andrew reports that the engine ran for 1,005 hours and raised 1,870,305 cubic feet of water an average height of 23

feet. The area under cultivation was 17.66 acres which yielded crops worth Rs. 1,691. The cost of running the engine was Rs. 303-10-9 to which may be added another Rs. 300 for interest and depreciation making the total cost of irrigation per acre Rs. 34.1. The details of the running expenses were as follows :—

		RS.	AS.	PS.
Liquid fuel	111	6 6
Kerosine oil	35	10 0
Lubricating oil	48	1 6
Wages	74	0 0
Repairs	34	8 9
Total		...	303	10 9

(10) At the Agricultural College, Saidapet, a 6½ H.P. engine and a 4" pump were employed in lifting water from the Adyar river. During 1907-1908, 25,660,000 gallons of water were raised, an average height of 21.57 feet, the lift varying between 19.3 and 24.1 feet. The total cost of working the engine was Rs. 620-14-3, to which may be added Rs. 350 for interest and depreciation. The area of land irrigated was 25.71 acres and the cost of irrigation per acre Rs. 37.7. The details of the working expenses were as follows :—

		RS.	AS.	PS.
Liquid fuel	173	12 0
Kerosine oil	19	12 0
Lubricating oil	87	13 9
Wages	238	4 4
Repairs and belting	97	13 0
Miscellaneous	3	7 2
Total		...	620	14 3

The pump was run on 194 days for 1,976 hours or an average of 10.19 hours per day. The volume of liquid fuel consumed was 1,200 gallons, at the rate of 0.61 gallons per working hour.

(11) Installation of a 4" pump and a 6½ H.P. engine on a small tank at Surapet belonging to Mr. Gopinatha Tawker. Subsequent to the installation of the engine and pump a boring at the bottom of the tank tapped a sub-artesian supply which through a 4" pipe furnishes sufficient water to keep the engine running 12 hours a day. The cost of installing the engine and pump and making channels for the distribution of the water was Rs. 3,242. The area under irrigation is 28 acres and consists of a mango and cocoanut tope; the trees of which have not yet come to bear fruit. Between the trees plantains have been cultivated, there being about 450 to the acre against an average of 900 to the acre in an ordinary plantain garden. The accounts now furnished extend over two years and show that Rs. 2,833-1-0 was realized from the sale of the plantains and Rs. 871 from the sale of a crop of paddy which was grown on 21 acres after the plantains were removed. The expenses of cultivation during the two years amounted to Rs. 1,074 for the plantains and Rs. 277-8-0 for the paddy. The cost of running the engine during the two years was Rs. 869-15-6 so that against gross receipts of Rs. 3,704-1-0 the total expenditure amounted to Rs. 2,221-7-6, leaving a surplus of Rs. 1,482-9-6. An allowance of Rs. 405 a year should be made for interest on the capital outlay and depreciation in value of the plant, but against this must be set the increased value of the mango and cocoanut topes which during the two years have been well watered.

(12) Installation of a 3" pump and a 5 H. P. engine belonging to M.R.Ry. Muniappa Gramani at Tondiarpet. The lift varies from 12 to 25 feet and the engine works from 9 to 11 hours a day and waters two cocoanut plantations each of about 4 acres. One of these gardens is let

out on lease for Rs. 100 a month, the water being supplied free. The other the owner works himself. The yield of toddy is about 70 measures a day and is sold for $3\frac{1}{2}$ annas a measure. The total monthly sales average Rs. 400 and the expenditure Rs. 140, leaving a net profit of Rs. 260 a month. No details are kept regarding the cost of working the engine but it amounts to an average of Rs. 60 a month and repairs and renewals average Rs. 120 a year. The total expenditure therefore is Rs. 2,520 and the income Rs. 6,000, leaving a gross surplus of Rs. 3,480 which is unquestionably a good return on a garden of not more than 8 acres.

(13) Installation of a $7\frac{1}{2}$ H. P. engine and 4" pump belonging to M. R. Ry. T. S. Narayanasawmi Aiyar of Tirukkarugavur. The water-supply is derived from a tank 120 feet square and the pump is carried on a circular well 9 feet in diameter sunk in the bank of the tank. There is more than sufficient water-supply and the land under irrigation consists of sugarcane 3 acres, plantains 5 acres, cocoanut garden 7 acres and paddy 13 acres. The owner writes as follows :—‘ The gross income is Rs. 700 from sugarcane and Rs. 300 from plantains. With the assistance of the plant I am able to sow seed-beds very early and thus reap the first crop so that my second-crop transplantation is simultaneous with the single crop lands of my neighbours. By this I get Rs. 15 per acre more than my neighbours who, though they grow double crops, have to wait for water from the channels to sow their seeds, while I can transplant the first crop when they begin to sow their seed-beds. The total cost of the plant including Rs. 1,000 spent on the well and tank was Rs. 3,900 and apart from my own cultivation my additional income from 39 acres of wet land is Rs. 595.’

From the above notes the following table has been extracted to show the actual cost of supplying each acre of land with water.

Reference number of installation.	Diameter of dis-charge pipe of pump in inches.	Area irrigated, acres.	Duty of water in acres per cusec.	Working expenses.		Interest and depreciation.		Total.		Cost of irrigation in rupees per acre per annum.
				RS.	A. P.	RS.	A. P.	RS.	A. P.	
1	4"	18	81	552	8 0	383	2 0	935	10 0	520
3	4"	15	67.5	693	1 4	343	12 0	1,026	13 4	68.5
4	4"	23	103.5	690	0 0	400	0 0	1,090	0 0	43.5
5	4" (2)	48	108	904	0 0	898	12 0	1,792	12 0	37.4
6	6"	70	95	1,018	1 6	666	4 0	1,684	5 6	24.10
7	4"	31.3	96	508	0 0	317	0 0	825	0 0	41.5
9	3"	17.66	240	303	10 0	300	0 0	603	10 0	34.1
10	4"	25.71	119	620	14 3	350	0 0	970	14 3	35.7
11	4"	28	126	435	0 0	405	0 0	840	0 0	30.0
12	3"	8	54	840	0 0	237	8 0	1,077	8 0	134.6

The data upon which the figures for the duty of water have been calculated are approximations. It is hardly worth while to discuss them in detail as the only object in inserting them in the tabular statement is to dispel the idea that very high duties are obtained under pumps. It is not improbable that the low duty in some cases is attributable to the limited area under the pumps and that more water was given to the fields than was really necessary or desirable. Both the nature of the crop and the physical condition of the soil are important factors to be taken into consideration in estimating the duty of water and to these must be added the character of the distribution of the rainfall as well as its total volume. With so many variants it is impossible that any one set of observations should be of great value. If the most is to be made of a supply of water risks must be run and experience is the only safe guide in such matters. To secure absolute certainty means that in four years out of five the water-supply is not fully availed of. Agriculture is the most speculative of industrial occupations and irrigation only eliminates one element of uncertainty.

The total cost of pumping has been estimated by adding $12\frac{1}{2}$ per cent. of the capital outlay to the running expenses to provide for interest and depreciation on capital. It will be seen from these figures that the cost of irrigation from wells, even when water is lifted by engines and pumps, is a very considerable item. Excluding the cocoanut gardens it ranges from Rs. 25 to nearly Rs. 70 an acre ; nevertheless, as we have seen, the profits realised are very considerable. The ryots appreciate this and the popularity of oil engines and pumps is steadily increasing. Yet, through the sub-division of the land into small plots, the smallness of individual holdings and the large capital outlay involved in each installation, it is difficult for landowners and ryots to become possessors of such aids to cultivation, and I think there is not much doubt that for every ryot who owns a pumping installation there are at least a

hundred who would be glad to have one, if only their circumstances would permit of it. With rising prices and with a sure water-supply the agriculturist is in a very satisfactory condition and in places there is evidence that by co-operation they are trying to secure for themselves the advantages of cheap methods of raising water.

Some little time ago the villagers of Atmakur formed a limited liability company with a capital of about Rs 14,000 and with this money we have installed for them two 10-inch pumps on the banks of the Kistna Western Delta main canal and through a channel which extends to a length of nearly four miles they are irrigating 500 acres of land considerably above the full supply level of the canal. In the South Arcot district, where it is easy to obtain a water-supply, some of the wealthier ryots have pumping installations and are selling the water they do not require for their own lands to their less wealthy neighbours. In the case of the Panampet installation alluded to above, the water is sold at the rate of 11 annas per hour which is equivalent to about 2,000 gallons for one anna. At this rate a cubic foot per second will fetch nearly Rs. 17 a day and will be worth at least Rs. 2,000 during the ordinary irrigation season of four months. In the Kistna Delta the duty of water rises to as much as 100 acres per cubic foot per second and for this a water-rate of Rs. 5 per acre is charged, or roughly one-fourth of that paid by the ryots in the Panampet village. Nevertheless the water-rate in the Kistna Delta is sufficiently high as the whole project pays a very high rate of interest on the total capital expenditure involved in the construction of the Kistna Delta irrigation system. It is the same with many of the other great irrigation systems in this Presidency. The lands under them are supplied with water at very low rates and the undertakings are at the same time very profitable to the State. The very careful and detailed examination of the country by the Irrigation Commission, which met a few years ago, has placed beyond doubt the fact that very

little water can in the future be made available for irrigation on similarly favourable terms, although the percentage of the total water-supply which is so utilised is extremely small. Vast projects involving an enormous capital outlay are feasible, but their construction can only be justified when it can be clearly shown that they offer a fair prospect of an adequate return on the money which must be invested in them.

The skill and ingenuity of the irrigation officers of the Public Works Department will probably yet succeed in some cases in providing additional supplies of cheap water for irrigation, but the limits prescribed by the scale of charges for water have been nearly reached and there must inevitably ensue a period of stagnation in the extension of irrigation unless efforts are made in other directions. Engineering science has made enormous strides since Sir Arthur Cotton first held up the waters of the Gó dávari river by the dam which he constructed across it at Dowlaishwaram, and many projects are feasible now which would have been impossible then. As an example I would commend to your attention the splendid pumping station which has been provided to lift the waters of the Kistna river for the irrigation of some 50,000 acres of land on Divi island, whereby water which ran uselessly to the sea is now made to fertilise lands which have hitherto lain waste or yielded at best a very precarious harvest. Again in the mountains of Travancore the waters of the Periyár river, which formerly flowed into the Arabian Sea, have been diverted through the watershed ridge to irrigate a vast extent of land in the Madura district, thereby rendering it secure from scarcity and famine. It would be easy to multiply examples of this kind ; it is not however my object to glorify the engineering profession but to draw attention to the fact that in other directions, here in India, we have not made similar progress.

The resources of the hydraulic engineer are by no means exhausted and he could still do much to render the

occupation of the great bulk of the people of this country much less precarious if only it were possible for them to second his efforts and display a more intelligent appreciation of the value of the water which he supplies. It would not I think be difficult to show that in this Presidency the area under wet cultivation could be doubled if the ryots, who are now without the benefits of irrigation, were prepared to pay a much higher water-rate than that now paid by those whose lands are so favourably situated that they are commanded by the channels from existing works. The question is, can they do so? Is it possible for the ryot to pay from Rs. 15 to Rs. 20 an acre for water instead of the Rs. 5 or Rs. 6 which is regarded as the normal rate under Government irrigation channels? The enquiry is not whether existing water-rates should be enhanced, but whether lands not now irrigated could be made to yield a sufficient return to make it worth while supplying them with water at a much greater cost than has hitherto been deemed practicable. It is generally considered that irrigation greatly enhances the value of land, partly by increasing the yield of the crops and partly by diminishing the risks of cultivation. The bulk of the irrigation supplies in this Presidency are devoted to the cultivation of paddy and it is only under spring channels and wells that what we know as garden cultivation may be said to exist. The fact is that paddy cultivation pays fairly well and the cultivators have an easy time of it; but when the ryot has to lift his water from a well or contribute his share of the labour of digging spring channels in hot sandy river-beds, he learns to appreciate its value, and by putting more labour into the land he obtains from it a more generous return.

The information which has been collected regarding the cost of lifting water by engines and pumps and the evidence that such water can be profitably used is, I consider, extremely valuable, but I do not wish to spoil my case by basing generalizations on it which are not justifiable. The irrigation under the oil engines and pumps,

which has been referred to above, is all of an exceptional character. Admittedly, they are selected cases to show what can be done when capital, energy and intelligence are forthcoming. They are, however, typical instances of irrigation with oil engines and pumps, where an adequate water-supply has been found, and I have reason to believe that there is room for many thousands of such installations in the Coast districts and on the margins of many of our rivers. Their influence on agricultural development is already considerable and not a few are regarded in their own neighbourhood as model farms. The results obtained in them have awakened a new interest in well cultivation, and throughout the Presidency there is a growing demand for the exploration of the sub-soil with boring tools. The demand is for a perennial water-supply which will enable irrigation to be carried on all the year round so that more valuable crops, which require to be on the land for a long time, may be cultivated.

Government irrigation works connote paddy cultivation because almost invariably the supply of water is only available for a portion of the year. To some extent this must also be the case in the future, but by no means entirely so. All the great projects now under investigation will involve the construction of enormous storage works, partly to regulate the supply during the irrigation season and partly to raise the flood waters to a sufficiently high level to command the lands that require irrigation. When the water has fallen below the sills of the regulators which will control the supply to the high level channels there will still remain a vast quantity of water stored in the river-beds behind the dams, and this may be drawn off at such a rate as to provide for the perennial irrigation of very considerable tracts of land. On these lands very high water-rates should be realised as very valuable crops can be grown. In the Bombay Presidency, on some of the storage works which have been constructed in the Deccan, sugarcane cultivation is extensively pursued notwithstanding the fact that a

water-rate of Rs. 50 per acre per annum is charged. Such cultivation involves considerable capital outlay and a large expenditure in manure. It is analogous to the oil engine cultivation which we are developing on this side and which kind of cultivation it is my object to point out might be developed on a much larger scale if, in the future, it is found feasible to construct the great masonry dams which have been projected for holding up the waters of the Kistna, the Cauvery, the Tungabhadra and other rivers. More irrigation in the South of India we must have, and because we have exhausted all the easy methods of obtaining water for irrigation there is no reason why the country should stand still and accept the fact that nothing more can be done. If water cannot be obtained at Rs. 5 an acre it is an undoubted fact that large supplies could be given at a cost of Rs. 10 an acre, and still larger supplies if it could be shown that water is worth Rs. 20 an acre. The cultivation under oil engines and pumps, the enormous area under irrigation from wells and the high rates paid for water in the zemindari tracts all tend to show that there is still a very wide margin for the irrigation Engineer to operate on.

Accepting the figures which I have placed before you as accurately representing what can be done under the conditions specified, there can be no doubt that if such work could be carried on over thousands of acres as it is now carried on over tens, it would be a comparatively simple matter to finance the great engineering works which will be necessary to supply water. Unfortunately it is practically certain that at the present time the cultivators are not in a position to take large volumes of water on the same terms as are easily obtained in all the cases I have brought to your notice. The average ryot lacks capital, lacks initiative and above all is imbued with the idea that irrigation means an easy life and not a strenuous one. Before the great irrigation works of the future can be carried out, the average ryot, who cultivates dry land, will have to be

brought to understand that his slovenly and lazy methods of working can be no longer tolerated, and that if he wishes to continue in the possession of his land he must be prepared to cultivate it properly. There is much for him to learn and the problem is how to teach him. The extension of irrigation by pumping will probably prove one of the most effective means of diffusing throughout the country a better knowledge of the principles of agriculture and all means which are adopted to encourage the extension of this method of lifting water will tend to bring about the desired end. Nearly everywhere it is the poverty of the individual and the extreme sub-division of the land which makes progress slow. Nevertheless where the conditions are favourable great strides have been made.

In the South Arcot district in the Villupuram and Cuddalore taluks the conditions in regard to water-supply are unusually favourable. Vast beds of sand lie at no great depth below the surface of the ground and from these it is practicable to obtain a supply of from 20,000 to 30,000 gallons of water per hour from wells not more than 15 or 20 feet in diameter sunk into the sand. Already over 50 pumping plants have been installed in these two taluks and many more are under consideration. In not a few instances the whole capital outlay involved has been realised within the first year and in nearly every case, within two years the cost of these pumping installations has been recouped. In place of 50 engines and pumps there is probably room for 1,000, and that too without seriously affecting the water-supply. If private enterprise were stronger and capital more abundant, the irrigation problem in these two taluks would be easily dealt with. The ryots have water and land and if supplied with power to lift the water so as to make it available for cultivation, they can obtain large profits. Under these circumstances the capitalist would step in and provide power on terms which would be advantageous both to the supplier and the user. A central power station would be established either

near the railway or away on the borders of the Salem district in the middle of the forest from which it could derive its supply of fuel. The combination of a wood distillation plant with a central power station should prove a very remunerative undertaking if worked on proper lines. In the forests the timber would be cut down and converted into charcoal. The charcoal on the spot would be used in large suction gas plants to generate electricity. Electric currents under high pressure would be carried across the country to the points where the power could be used and there it would be transformed down to a reasonable pressure, and from each sub-station wires would radiate to the wells in the neighbourhood.

In many cases ryots already own wells which will yield large quantities of water or which can be greatly improved by sinking them a few feet deeper. If the Power-supply Company would instal its own motors and pumps and undertake to lift the water there is scarcely any doubt that the demand would be considerable. The ryots can afford to pay as much as one anna per thousand gallons and probably by charging a fixed rent for the motor and pump plus a rate for the actual amount of power taken there would be no difficulty in putting the distribution of power on a sound commercial basis. The charcoal manufacturing plant should be of a modern type fitted with all the apparatus necessary to obtain the valuable bye-products of which the most important are acetate of lime, methyl, alcohol, and tar. Of course such a plant can only be worked with profit when the scale of operation is sufficiently large. Half the charcoal manufactured in the wood distillation plant would be required for the recovery of the bye-products and for working them up into a marketable condition whilst the other half would be available for the suction gas plants which would supply gas to the engines driving the dynamos. Three thousand horse power would, I think, in a short time be taken up within the area I have mentioned, as not only would it be used for pumping

water but also for driving oil mills and other machinery. To a limited extent there will be a demand for lighting purposes and it can hardly be doubted that, once a supply of power was available, a considerable number of miscellaneous ways in which it could be usefully employed would soon be discovered. A plant, with an average output of 3,000 horse power for 12 hours a day, would require 20 tons of charcoal per day or roughly 7,000 tons in the course of a year; so that if all the by-products were recovered upwards of 14,000 tons of charcoal would have to be manufactured every year. This would involve the carbonization of about 50,000 tons of wood per annum, and assuming that the annual increment in the forests is one ton of wood per acre per annum an area of 50,000 acres of forest would be required. This could be reduced if suitable plantations of casuarina or some other quick-growing timber were made. Already there are in the South Arcot district some 11,000 acres of private plantations and a large extension of these to supply fuel for power purposes would ultimately be of immense benefit to the district.

It is useless at the present moment to endeavour to work out such a scheme as I have outlined in any detail. My object in bringing it forward is to indicate one of the directions in which work should be undertaken in future. The scheme I have outlined is typical of the way in which industrial problems must be tackled. Whilst it is possible to do a great deal by establishing a large number of small centres of industrial activity, it must be remembered that these are, as it were, the pioneers who clear the ground for the greater undertakings which must follow. In South Arcot the small undertakings are proving exceedingly profitable and their rapid increase in numbers can be safely counted upon. They will bring wealth and prosperity to those parts of the district which benefit by them, and ultimately I am sanguine enough to anticipate that there will be an accumulation of surplus profits seeking for new outlets.

I have put forward these ideas simply to suggest the direction in which we are moving and to indicate in faint outline the tendency of the policy we are pursuing in this particular instance. The industrial regeneration of India is a vast problem which can only be achieved by steady persistent effort continued for a long period. The difficulties to be faced are enormous and the first step must be to educate the people to a sense of their own deficiencies and to bring them to gradually take an interest in the practical solution of the problems presented. I think I may claim that the success which has attended our efforts to introduce oil engines and pumps for lifting water, marks the first stage in the new movement and it has awakened in the minds of thousands of landholders and ryots an interest in mechanical methods of doing work which is entirely new to this country. Considering the marked inaptitude of the agricultural community for mechanical methods of working it is surprising how easily they have learnt to manage oil engines and pumps and I think it is unquestionably because they fully appreciate the advantages which they confer and are willing to take the necessary trouble to understand how they work. Quite recently I have inspected a considerable number of these pumping stations entirely managed by the ryots themselves and I think there is no doubt that the engine and pump is to the ryot who possesses it what the motor car is to the average European. The one is spreading a knowledge of mechanics through the literate classes of Europe and the other through the illiterate classes of Southern India.

APPENDIX.

The following table gives information under the various heads enumerated regarding a number of the installations which have been erected. In many cases the ultimate area which will be irrigated will greatly exceed the area noted as full advantage is not yet taken of the water-supply available :—

Name of Installation.	Horse power of engine.	Diameter of delivery pipe of centrifugal pump.	Maximum lift in feet.	Total cost.	Area irrigated.	Names of water-supply.
				RS.		
Alinjivakkam ...	5	3"	20	2,000	7	Well.
Kumaravaram ...	5	3"	19	2,310	15	"
Salai ...	5	3"	22	2,046	13	"
Panamkuppam ...	5	3"	19	1,707	15	"
Tondayapet ...	5	3"	25	2,000	8	"
Orrakadu ...	6	4"	19	2,240	14	"
Anamalai ...	6	3"	27	2,445	12	Upper river.
Panjetti ...	6	4"	21	2,375	15	Sub-artesian.
Kolianur ...	6	4"	20	2,092	18	Well.
Anichambalayam ...	6	4"	16	2,055	20	"
Siruvanur ...	6½	4"	21	2,615	40	"
Thattanpalayam ...	6	4"	26	2,380	31	"
Surapet ...	6½	4"	18	3,211	28	Sub-artesian.
Kalasti ...	7½	3"	30	2,096	10	Well.
Ravanasamudram ...	7½	4"	23	2,719	15	"
Sothuperambedu ...	7½	4"	24	2,487	11	"
Vichur ...	7½	4"	21	2,696	12	Sub-artesian.
Surapet ...	7½	4"	22	2,185	14	"
Mangudicherry ...	7½	4"	21	2,277	7	Well.
Arugalavadi ...	7½	4"	23	2,535	22	"
Kirumambakam ...	7½	4"	17	2,200	17	"
Kaliyanur ...	7½	4"	25	2,398	20	"
Manavanthangal ...	7½	4"	21	2,266	12	"
Tirukarugavur ...	7½	4"	14	3,900	28	Trnk.
Kalinjikuppam ...	7½	4"	25	2,435	40	Well.
Punjerikuppam ...	7½	4"	23	2,800	23	"
Kodamangalam ...	7½	4"	18	2,195	18	"
Valavanur ...	7½	5"	20	2,285	21	"
Ariyalur ...	7½	5"	17	2,586	45	"
Melrajankuppam ...	7½	5"	18	2,516	50	"
Sholavalli ...	9	4"	15	2,380	16	"

Name of Installation.	Horse power of engine.	Diameter of delivery pipe of centrifugal pump.	Maximum lift in feet.	Total cost.	Area irrigated.	Nature of water-supply.
				RS.		
Nellikuppam ...	9	4"	16	2,750	15	Well.
Cuddalore ...	9	4"	30	7,000	48	Sub-artesian.
Do. ...	9½	4"				
Palur ...	9	6"	19	3,700	34	Well.
Do. ...	10½	4"	15	2,940	18	"
Parampet ...	9½	6"	16	5,000	70	Tank.
Kavanipaukam ...	9	4"	15	2,345	20	Well.
Thukanambakkam ...	10	4"	15	3,490	14	"
Melpattanbakam ...	10	4"	23	3,340	19	"
Achiyalpuram ...	9	6"	18	2,665	35	Tank.
Surapet ...	12	6"	18	3,800	29	Sub-artesian.
Atmakur ...	12	10"	8	14,500	500	Kistna western delta
Do. ...	12	10"				main canal.
Gudiyattam ...	12	5"	25	3,100	27	Well.
Laccaveram ...	14	6"	14	5,000	20	River.
Manoor Lanka ...	16	10"	7	6,000	200	Colair lake.
Kattalai ...	25	12"	16	15,000	300	River Cauvery.

SOME REMARKS ABOUT THE PRACTICE OF USING COW-DUNG AS FUEL.

BY J. B. KNIGHT, Esq., M.Sc.,

Professor of Agriculture, Agricultural College, Poona.

It has often been deplored that the manure which rightfully belongs to the land is so generally used as fuel in India, thereby impoverishing the land and reducing the outturn that could otherwise be obtained if all the manures were returned to the cultivated land but the hitherto unanswerable reply has been that 'We must have fuel' and as our wood and coal supply are limited there remains nothing but to use the dung.

To find out exactly what is our loss and to see if there is no remedy to it is the purpose of this hastily prepared paper.

In the first place let us take the dung from a pair of bullocks and see what is the loss in burning. A pair of bullocks will produce daily about 70 lbs. of dung, a large per cent. of which is water. But we will get about 11 lbs. of air-dried manure containing about 1.15 per cent. of nitrogen or about 2 ounces daily or in a year $45\frac{1}{2}$ lbs. This quantity of nitrogen as oil-cake will cost in Poona Rs. 22-12. I have not taken into account the other plant food elements because they cannot be easily estimated, nor the beneficial mechanical effect which coarse manure like cow-dung exerts upon the soil as it is very difficult to estimate these. But I am quite prepared to raise the figures obtained from calculation based upon the nitrogen alone to Rs. 25 as the worth of the dung over the ashes from the same dung from a pair of bullocks in one year.

Now let us see what would be the value of dung if sold as fuel. Eleven lbs. daily will equal 4,015 lbs per year. Cow-dung cakes in Poona sell by retail at about 1 lb. per pie so that the amount received from retailing the manure from the pair of bullocks would amount to only about Rs. 21 per year, and thus by this wasteful practice we lose Rs. 4 on each pair of bullocks.

But there is another aspect of the case. What is the value of this 4,015 lbs. of dry cow-dung as a fuel when compared with other fuels as kerosine? To work out this comparison I made comparative tests in finding out how much of each was required to raise 50 lbs. of water from ordinary temperature to boiling, but unfortunately these tests as made are partial to the dung as the time was not carefully made equal, but not considering the time I find that it takes about 9 lbs. of cake to give the same heat as one pound of oil or that 4,015 lbs. of dung is worth 446 lbs. of oil or $12\frac{1}{2}$ tins which at Re. 1-10 per tin is about Rs. 20-4 so that there is still a loss of Rs. 5.

More careful experiments along this line need to be made. These I will undertake and publish later. The cost of drying and making into cakes has not been considered or the trouble of retailing them.

EXPRESSION AND EXTRACTION OF OIL

BY P. RAY CHAUDHURI, ESQ., BAR-AT-LAW,

Calcutta.

I.—THE BUSINESS PROSPECTS.

In the paper I submitted before the Conference held last year at Surat on the subject of 'Oils and Oil-seeds,' I presented a concise survey of the condition of the trade regarding the principal oils and oil-seeds of our country, showing, from admitted statistics, the enormous export of oil-seeds instead of only the oil yielded by them. I endeavoured to point out that by this process the country was being daily impoverished in three-fold ways, namely, first, our labourers were deprived of the work and wages that ought legitimately to belong to them, secondly, the soil was constantly being denuded of valuable manurial constituents, and thirdly, our cattle were being deprived of a very rich and concentrated auxiliary food. It is a matter of great consolation to me, therefore, that, since writing my last paper, I have had many inquiries from various quarters, all asking about the possibilities of starting a small oil-mill in their locality and desiring me to furnish them with an estimate of the cost and profit of small oil-mills. When I was requested by the Conference to submit a supplementary paper to my last one, I was persuaded to believe that it would be the best thing to choose my present subject for consideration and incorporate in it the estimates from the pioneer engineering firms of Calcutta and elsewhere, dealing with oil-mill machinery. I addressed letters to all the principal firms of the description and I am glad to be able to say that they readily responded to

properly to gauge the weight of these difficulties at the outset, so that there may be no occasion for disappointment after once launching into a concern.

Small oil-mills have less chances of success than larger ones. There are certain expenses, especially, for instance, expert labour, which have to be borne in the case of a small mill as well as a large one. While the larger mill, yielding a larger income, is capable of equalising the expenses over the large outturn, the small mill has to bear the whole brunt of it over its moderate outturn. To avoid any misunderstanding, I consider it desirable here to mention that I do not advocate the starting of tiny mills to be worked by cultivators themselves. The only way to work this business is to have seed-crushing companies, independent of the cultivators, scattered at convenient centres. Whatever may be the manifold short-comings of the caste-system prevalent in India, it cannot be gainsaid that it has all along stood in good stead in making and maintaining the efficiency of the members of individual classes being trained up from childhood to be specially qualified to carry on the particular calling peculiar to those classes. A cultivator should mind his cultivation and should not be hampered with duties that are more or less foreign to his ordinary ones. Nobody will, in these democratic days, dare to hold a brief on behalf of hereditary trade callings; but, nevertheless, it has to be admitted that it is poor economy to invest in one man divers duties unallied to each other. It is but an elementary principle of economics that properly adjusted division of labour leads to expedition, efficiency and cheapness of manufacture.

Before starting a mill, big or small, one ought carefully to reconnoitre the prospects of the locality where the mill is proposed to be opened. It is well to remember that it is a bad principle to start a mill, at any place, of a handling capacity larger than the probable outturn of oil-seed in the locality in a year. The mill may have to stop working for some months in the year, owing to paucity of

procurable oil-seeds. It may, in certain agricultural localities, be possible,—and indeed, Mr. J. G. Cumming in Part II of his Special Report (*vide* "Calcutta Gazette," Aug. 26, 1908) mentions the name of Babu Baij Nath Goenka of Monghyr who has shown considerable enterprise in the direction,—to have a combined mill for the treatment of cognate articles, such as flour, grinding, timber-cutting, sugar-making, rice-husking, etc., so that, even when the year's outturn of one description of agricultural produce of the locality is exhausted, the mill can, nevertheless, continue to work on and handle the next crop that appears in the year by rotation. It is not possible for me, within the short space available, to enter into details of this scheme and lay down individually the combinations suitable for various agricultural centres. I must, therefore, beg to leave these matters of detail to be worked out by local promoters of proposed mills.

At the very threshold almost, the advocate of oil-mills in the interior and more or less inaccessible country is met by the serious problem of speedily having necessary repairs to execute to breakages of machinery that accidents might bring about. Instances are not at all rare where this difficulty of having broken or unworkable parts of machines expeditiously attended to, proved to be insurmountable enough to force the closing of mills otherwise full of bright prospects. It is well, therefore, that, at the time of purchasing a machine, preference should be given to the one that is free from much intricacy consistently with efficiency and also that an assurance should be obtained from the engineering firm offering the machine for sale that, when needed, it will be possible for them to execute any repairs, perferably at the mill premises, by the sending, without delay and much expense, of a competent workman thoroughly conversant with every part of the machine in question. There are various machines offered for sale in the market by petty engineers who do not themselves understand the working thereof. It is recommended, there-

fore, in all instances, to go to a first-class business house for every description of requirement. Happily oil-mills are so simple in their construction that no serious fear need be entertained for having the repairs speedily and cheaply attended to. In most cases, an ordinary foreman, with resourcefulness, will, I am inclined to think, be competent enough to mend matters. The suggestion of engaging a flying mechanic on behalf of several neighbouring mill-owners, within tolerable reach of each other, and of furnishing him with a moderate workshop at a central place, maintained by rateable contribution from those mill-owners, is well worth careful consideration.

The subject of a suitable market for the disposal of the mill outturn ought next to engage the attention of the promoters of proposed mills. Local needs may not be large enough to assure the local disposal of the whole of the outturn. In such a case, it will be necessary to send away the surplus to a near or distant market for disposal. The site selected for the mills should, therefore, be within the easy reach of a railway station or a river, navigable throughout the year, to convey the outturn to the market, without entailing extraordinary expenditure. Competition, again, is another matter that should not be left without some consideration ; it is a factor that may exercise a baneful or beneficial effect on the concern according to the circumstances and conditions of the locality, and of the produce and demand of oil and oil-seeds there. Any measure to stop the export of a commodity, not required for home consumption, is economically injurious to the welfare of a country. Retaining in the country so much of the separated oil as is required for home consumption, we ought to export the surplus abroad, to import in return articles we strictly require for the welfare of the country and which are incapable, at the present stage of our industrial growth, of being manufactured here, efficiently and cheaply.

While on the subject of export, I must not omit to mention, in passing, another difficulty which stands in the

way of the development of the oil-industry in our country, namely, that of procuring suitable receptacles for conveying the oil to the ultimate market. Not having any iron foundry yet, the question of steel drums being used for the purpose must, for the present, be left out. There are, no doubt, workmen in India who can manufacture wooden barrels suitable for the purpose; but unfortunately, their number is not very great and it would simply be impossible for them to cope with the demand relying only on manual labour. The only possible solution of this problem is to start factories properly equipped with modern timber-pressing machinery for manufacturing barrels. I have been assured by unimpeachable authority that it will not prove to be a difficult task at all to find the wood from our forests suitable for the purpose. Probably, if and when we have a sufficient number of oil-mills scattered all over the country, the demand for the barrels will justify, and there will not be any want of enterprising capitalist for, the starting of factories for their manufacture.

The subject of the disposal of the bye-products of the processes of expression and extraction oils from seeds is again fraught with no inconsiderable difficulties. It has been mentioned that the oil-cake is very rich in manurial constituents and forms a nutritious, palatable, and highly concentrated auxiliary food for cattle. In the essentials that constitute the worth of the oil-cake, the presence or otherwise of any great percentage of oil in it is a matter of more or less indifference. Oil is principally derived from the atmosphere and not the soil and does not, by its presence, in any way advance the value of the cake for the manurial purposes, while, when the percentage of oil is enormous, a major portion of the oil present in the cake eaten by cattle is rejected by the stomach. It ought to be the aim to express or extract out of the seed as much oil as possible, it being a sheer waste to leave a large portion thereof in the cake. The cake that is turned out by the *ghanies* in our country has in it a very large percentage of oil and

is not healthy for the cattle to feed on. But then, the common people of our country, with their usual conservative propensities, cherish the wrong notion that the cake with a larger amount of oil left in it, is good for the cattle and nothing will persuade them to understand that the cake denuded of a larger percentage of oil is just as suitable, if not more, for the purposes for which they are used. This, I am told by the highest authorities, stands in the way of the disposal of the oil-cake from the oil-mills of modern appliances we have in our country. It is a great pity that the ignorance of the people should frustrate the realisation of the very object for the attainment of which it is proposed to scatter oil-mills throughout the country. The remedy is obvious. I am inclined to think that the time has arrived to organise in India similar institutions as the 'University Extension Lectures' to drive such ignorance to the wall.

Having thus indicated the principal difficulties in our way, of a general description,—there may be other difficulties of more or less importance peculiar to particular localities,—I propose next to describe the processes of expression and extraction of oil from the seed. There are two principal methods of separating fixed vegetable oils from nuts, seeds, etc., *viz.*,

(1) *Expression* of oil by pressure, with or without the application of heat;

(2) *Extraction* of the oil by the agency of chemical solvents.

2.—THE EXPRESSION OF OIL.

From time immemorial, by far the more popular process of separating oil from the seed has been by administering pressure on the latter. Various ingenious devices have been invented and this still continues to be the popular process. While other countries have introduced various innovations to make the process of expression more effective, we have still the old antiquated implements for the purpose, handed down to our present generation. The *Checkao* mills of the Coromandel Coast, the *Kulu*

machines of the Punjab and the *Ghanics* of Bengal are instances of the old machines such as those. One is filled with admiration when he ponders over the ingenuity of these old devices and with the evidence they furnish of the acute knowledge of the science of mechanics that our ancient ancestors must have possessed to invent such wonderful devices. Simultaneously with that admiration comes the knowledge of the regrettable unworthiness of later generations who rested content with the possession of their legacy and never attempted to advance a step further.

The *Ghani*, commonly found in the modest shop of a village *teli* or *kalu* (oilman), is formed of a trunk of *vabla* (*Acacia Arabica*) tree of about eighteen inches diameter and of about 8 to 11 feet in length, about two-thirds of which is sunk underground to form as it were the foundation of the machine. The portion of the trunk that remains overground is nicely lathed round to form a cylindrical column. In the middle of this, from the top, is hollowed out a hole about four inches wide and about a couple of feet deep, which, with age and constant grinding, assumes much larger proportions, till it is found to be unworkable. A thin lateral outlet, about a foot-and-a-half from the ground-level, meets the bottom of the central hole and serves the purpose of letting out the expressed oil, to be received in a receptacle placed on the ground for the purpose. This may be termed the 'mortar' portion of the *ghani*. The head of the trunk is strongly bound with an iron rim, called the *ber*, to prevent it from splitting and giving way. A cup-shaped wooden 'receiver' is placed on the top of the trunk and is called the *penri*. It is hewn out of an entire mangoe-tree trunk and into it is put the seed required to be expressed. A wooden pestle, called the *jat*, somewhat of the shape of an Indian-club; is placed within the mortar to work round and round and grind the seed between it and the wall of the mortar. The *jat* is usually made of *vabla* or *cusum* (*Carthamus tinctorius*)

wood. The head of the pestle projects a foot or more above the side of the wooden receiver and over that end of the pestle is placed a small wooden cap which is again securely chained to a post that stands perpendicularly from the arm of the yoke-bar of the *ghani*, called the *katur*. One end of this lateral projecting plank, the *katur*, is cut in the shape of a segment of a circle to fit nicely to the side of the central trunk, round which a notch is cut about half an inch deep to receive it. This *katur* revolves round the central trunk, and being fastened with the pestle, makes the latter revolve also within the mortar. To the other far end of this *katur* is placed the yoke, or the *jowal*, to which the bullock is attached to work the *ghani*. The *katur* also forms a convenient resting place for the man in charge and on it are also placed huge boulders and sacks of earth as weights. This completes the *ghani* of Bengal and costs, at most, Rs. 40 or Rs. 50. With constant work, a *ghani* enjoys a life of from 4 to 6 years, with one or two renovations of the central mortar. As the central hollow of the mortar, by use, becomes wider and deeper, the leverage of the pestle round its sides is considerably diminished. The trunk is then uprooted; the top portion of it which served as the mortar, now unworkable, is removed; and a new mortar formed, and used over again for the *ghani*.

The *ghani* is capable of expressing oil only from small seeds such as mustard (*Brassica Linn.*), gingelly (*Sesamum Indicum*), niger seed (*Guizatia Abyssinica*), poppy seed (*Papaver Sumniferum*), or radish seed (*Raphanus Sativus*). It is not suitable for the expression of linsed (*Linum Usitatissimum*) nor for that of castor (*Ricinus Communis*) or other larger nuts, or even copra. Excepting the preliminary process of cleaning from dust, sand and other impurities and that of slightly wetting before being placed in the cup-shaped receiver, the seed to be treated in the *ghani* does not receive any primary process, such as grinding or heating. The addition of the water to

the seed is probably made to ensure the pestle to work on the seed and not escape it, which is inevitable when the seed is dry. The quantity of water needed depends largely upon the quality of the seed, the older it is, the more is the quantity of water required to be mixed with it.

I have ascertained from enquiries from the country *kalus* and *telis* that about three maunds of mustard are required to yield a maund of oil; that in six hours, from 6 A.M. to 12 noon, it is possible to crush between 15 to 17 seers of the seed; that during those hours, three bullocks are changed, each working for two hours; that, on an average, about 3 days' time is required to express a maund of the oil; that the cost of three maunds of mustard, capable of yielding a maund of the oil, is Rs. 20, or thereabouts; that the cost of feeding the three sets of bullocks for working the *ghani* for three days is about Rs. 2; that the wages of the workman to attend to the *ghani* during the three days is about Re. 1; that the probable price expected from the sale of one maund of pure unadulterated mustard oil is Rs. 20, at 8 as. per seer; and that the sale price of two maunds of oil-cake is about Rs. 5. On the basis of these figures, a profit and loss account works out as follows:—

Cost :

3 maunds of mustard	Rs.
Feeding of 9 bullocks	... 20
Wages of 3 workmen	... 2
	... 1
	<hr/> Rs. 23

OUTTURN :

	Rs.
Sale of oil	... 20
Sale of cake...	5
	<hr/> Rs. 25

The above table thus shows a probable profit of Rs. 2 for each three days, which works out to Rs. 20 per month, or Rs. 240 per year. Taking, therefore, the rent of the hut to be Rs. 40 a year, and the initial outlay at Rs. 200 including the price of three bullocks, the concern, modest as it is, promises to yield as near cent per cent. of profit as one may wish for. With economy and multiplication of

ghanies no doubt one may even expect a higher percentage of profit.

The above figures are instructive in another way. They show how usurious the Indian mill-owners must be to long for larger profits and, for the purpose, with impunity mix with mustard, other cheaper seeds, much to the disgust of their customers. The plea of the necessity of mixing the minor seeds to facilitate the expression of oil has, to my entire satisfaction, been proved by authorities as well as actual demonstration to be untenable.

The primitive process of separating the oil from larger seeds in our country, such as the castor or *mahua* (*Bassia latifolia*), that has come to our generation, is the use of a screw-press and, in some instances, a stamper press. For being used under the screw, the seed is required to be pounded and then two draws of oil are generally obtained. The meal is put into woollen or horse-hair bags, one on the top of the other, and pressure of the screw is brought to bear on these bags, and the oil allowed to ooze out from their sides. The yield is called the 'cold-drawn' oil. The meal is then turned out of the bags, ground and roasted for some little while and put into the bags over again, and while still hot, receives the second pressing to yield the remaining available oil in the meal.

The next step in the way of advance is the modification of the country *ghani*, of quite recent origin, so that the same might be worked by pulley by steam-engine. It is this form of *ghani* that is used in almost all the mills extant inaugurated and managed by our countrymen. The mortar, apart from the gearing thereof, is still locally made by the country *mistry* with the old *vabla* wood, the modification being only that the mortar revolves and the pestle is held in one position, whereas in the country *ghani*, used by the *kalu* and *teli*, the mortar is stationary and the pestle is made to revolve, as has already been explained. Through the kindness of Messrs. Burn & Co., Ltd., Engineers, Howrah, I am able to produce here an illustration of their

Patent Lever Pressure oil-mill of an improved type on the basis of the old *ghani*-system, ancient to our country. (Fig. 1.)

The type of oil-mill shown by the above illustration has proved a great success in extracting oil from mustard and other small oil-seeds. The quantity of seed which can be treated by one pair of mills per hour is about 10 seers, and the yield of oil per maund of seed is from 13 to 17 seers according to the quality of the seed. With regard to working, the power required is approximately $1\frac{1}{2}$ horse power per pair, in either single or double lines. When bullock power is used, only one pair of mills can be driven and a special bullock gear is necessary, the cost of which is Rs. 250 extra. Much useful work can be done by hand power, and Messrs. Burn & Co., Ltd., say that they have already supplied some of the largest jails with these mills to be worked by convict-labour, and they have been a marked success. The price of a pair of these mills, in accordance with the following specification, is Rs. 125 net for cash :—

FRAMES.—4 C. I. legs ; 2 C. I. oil-trays, fitted with C. I. neck bushes ; 2 C. I. step plates with C. I. square or round bushes ; 10 $\frac{5}{8}$ " tie bolts ; two 4" \times 1" V-shaped threaded set screws and necessary bolts and nuts fitted. The oil-trays are cast with trail-ends which are rigidly fixed to the wooden posts ; the ordinary W. I. stay brackets are thus dispensed with, making the machine stronger and more self-contained.

BEVEL WHEELS.—2 C. I. large bevel wheels with two 20" \times 2 $\frac{3}{8}$ " mild steel shafts fitted.

PULLEY PINIONS.—One 1 $\frac{5}{8}$ " cross-shaft with 16" \times 4" turned C. I. pulley ; 2 small pinions fitted ; 2 C. I. 1 block with gun-metal bearings, necessary bolts and nuts fitted. The speed of the pulley is 90 revolutions per minute.

MORTARS.—2 wooden mortars with 2" \times $\frac{3}{8}$ ", 2" \times $\frac{3}{4}$ " W. I. bands fitted, 2 C. I. neck rings of ample strength, twelve 14" \times $\frac{5}{8}$ " bolts and nuts.

HOPPERS.—Two 14 gauge mild steel hoppers, fitted with $2" \times \frac{1}{4}"$ W. I. bands.

PESTLES.—2 C. I. pestles of smallest size Nos. 2 and 3. These iron pestles bear greater pressure than wooden ones, and the production is larger in proportion.

YOKE BAR.—W. I. yoke bar of $1\frac{1}{2}" \times \frac{1}{2}"$, flat bar iron $1\frac{3}{4}"$ tie bolt.

CAPS.—2 C. I. caps with W. I. bands, fitted with set screws.

CHAINS.—2 $\frac{1}{2}"$ chains, 2 big shackles, 2 small shackles, with bolts and nuts.

LEVERS.—27'-0" \times 2 $\frac{1}{2}" \times \frac{5}{8}"$ levers.

WEIGHTS.—4 C. I. weights of 30 seers each, more or less.

LEVER POSTS.—2 wooden lever posts (teak or sal), with C. I. lever plates; one cross bar plate; 2 C. I. shoes, and 1 wooden $4" \times 4"$ cross bar.

MORTAR RESTS ON ROLLER BOXES.—2 C. I. mortar rests, with adjusting screws or C. I. roller boxes, with turned roller complete.

LEVER GUIDE POSTS.—2 wooden, teak or sal lever posts, fitted with W. I. guides.

SHAFT.—one 5'-6" \times 2 $\frac{3}{8}"$ turned line shaft; 1 C. I. coupling fitted; 1 stand with $\frac{1}{2}$ piece gun-metal bush; one 16" diameter by 4" C. I. pulley turned bore and key fitted. I have much pleasure in giving here the results worked out by Messrs. Burn & Co., Ltd., as to the cost and prospects of starting a small concern with only one pair of the mills.

IMPROVED PATENT LEVER PRESSURE OIL-MILL WORKED BY

"GARDNER" OIL ENGINE:—				Rs.	A.	P.
One pair of <i>Ghanies</i> , complete	...			195	0	0
One "Gardner" Oil Engine about						
9.5 B. H. P.	...	...	...	660	0	0
Water Tanks, Pipe Connection,						
Pulley & Belting, &c.	...	...		100	0	0
				<hr/>		
				955	0	0
				<hr/>		

Say, Rs. 1,000, erected at site,

IMPROVED PATENT LEVER PRESSURE OIL-MILL WORKED BY
BULLOCK GEAR :—

				Rs.	A.	P.
One pair of <i>Ghanies</i> , complete	...	...		195	0	0
One set of bullock gear	...	...		250	0	0
Belting, pulley, &c.	...	...		50	0	0
One pair of bullock	...	...		50	0	0
				<hr/>		
				545	0	0
				<hr/>		

Say, Rs. 600, erected at site.

DAILY UPKEEP OF OIL POWER PLANT.

					Rs.	A.	P.
Oil consumption—							
½ tin @ Rs. 2 a tin	...	...	...		1	0	0
Lubricating	...	...	...		0	4	0
Attendance—							
1 mistry	...	...	...		1	0	0
1 coolie	...	...	...		0	4	0
3 mds. seeds @ Rs. 4 per md.	...	...	...		12	0	0
Extra	...	...	...		0	8	0
Allowing for wastage	...	...	...		2	0	0
				<hr/>			
					17	0	0

DAILY OUTTURN OF OIL POWER PLANT.

1 md. oil	...	...	...	...	18	0	0
2 mds. cakes	...	...	...	...	14	0	0
				<hr/>			
Total outturn	...	...	...		32	0	0
Total upkeep	...	...	...		17	0	0
				<hr/>			
Profit	...	...	...		15	0	0

DAILY UPKEEP OF BULLOCK POWER PLANT.

Food of bullocks	...	...	...	...	0	12	0
Lubricating	...	...	...	...	0	4	0
2 men	...	...	...	...	0	8	0
3 mds. seeds	...	...	...	...	12	0	0
Extra and wastages	...	...	...	...	2	8	0
				<hr/>			
					16	0	0

DAILY OUTTURN OF BULLOCK POWER PLANT.					Rs.	A.	P.
1 md. oil	...	...	...	...	18	0	0
2 mds. cakes	...	...	...	...	14	0	0
Total outturn					32	0	0
Total upkeep					16	0	0
Profit					16	0	0

Rates upon which the above calculation is based would vary considerably according to the price of labour and seeds in the district where either of the systems is installed and the figures given are simply approximate and given merely as a guide. With due deference to Messrs. Burn & Co., Ltd., I am doubtful if the price they expect from the sale of cake is really obtainable. But allowing even the lowest price obtainable, I have made calculations which show a remarkably high percentage of profit.

I am glad to be able to reproduce here an illustration of a further developed mill-*ghani* by the kind permission of Messrs. Macbeth Brothers & Company of No. 12, Mission Row, Calcutta. (Fig. 2.)

The plate is taken from a photograph of an all-metal oil-seed crushing mill, worked on the same principle as the country *ghani*, but made entirely of metal throughout. These metal mills will go for months without any adjustment, and the life of the cast-iron mortar is 10 to 12 times that of the wooden article. About 2 maunds more of seed is crushed per diem by each pair of these improved mills, and 7 to 10 per cent. more oil is extracted from the seed, which alone will soon pay for the extra cost. Nearly all kinds of seeds can be crushed in these mills. All the bearings are fitted with gun-metal, and the whole is very substantially built. Price per pair, as illustrated, is Rs. 325. Packing and delivery, extra.

Having given an outline of the mills worked on the basis of the principles laid down by our forefathers, I propose next to give an outline of the modern advanced

process of expression of oil by pressure. To serve that purpose, I cannot do better than to quote here the information very kindly supplied by Messrs. Marshall, Sons and Company, Limited, the well-known engineers of Gainsborough (England) and Calcutta and Bombay, on behalf of their principals, Messrs. Rose, Downs and Thompson, Ltd., of Hull, the pioneers of modern oil-mill machinery. They say as follows :—

‘ The pressing system has been known and employed from the remote ages, and has now practically resolved itself into the use of two systems, the Plate, or Anglo-American System, and the Cage System. -

‘ The Plate or Anglo-American System is usually employed for the treatment of all seeds requiring one pressing only, a combination of the two systems being used for very oily seeds requiring two pressings, or for the production of two qualities of oil.

‘ The preparation of the oil-bearing material is usually the same for both systems, but, in order to fully explain the whole matter, we shall briefly outline the processes usually adopted for various kinds of seeds. As examples of seeds requiring to be crushed once only, we might take as the most common, linseed and cotton-seed, and we will describe the processes for both these seeds. As an example of seeds requiring to be crushed twice, we might take castor-seed and copra, or the flesh of the cocoanut.

‘ *Linseed*.—The first point in the art of seed-crushing to be observed, if the best results are to be obtained, is to see that the seed to be treated is perfectly clean and free from foreign substances. A great deal of linseed now upon the market is sold on a basis of 95% purity or even as high as 97% purity. In the case of seed of this class, it is not usually considered necessary to clean it further, but lower-valued seed is passed through a screening machine to remove the impurities. From the cleaning machinery, the seed is then passed to the rolls or crushing machinery, where the seed is rolled or pulverized. After

being converted into meal, it is elevated into the kettle or heater where it is heated and tempered. From the kettle, the heated and tempered meal is drawn off into the moulding machine or former, where it receives a first or preliminary pressing, before being put into the Anglo-American Press. As the cakes are moulded or formed by the moulder, they are taken from this former machine on steel trays provided for the purpose. As soon as one press has been filled by the pressman in this way, he turns on the hydraulic pressure to the press from the pumps or accumulators, as the case may be. As the pressure rises in the press, the oil begins to flow from the compressed meal, at first slowly, and then very rapidly, gradually ceasing when the bulk of the oil has been removed, and, when the pressure has been on for three or four minutes, the flow of oil simply dripping away from the now compressed cakes until the pressure is turned off. If more presses than one are being used, the presses are filled one after the other, until the whole battery of presses is charged. The presses are allowed to remain under pressure for a fixed period, which varies, under special conditions, from 10 to 40 minutes, and when the proper time has elapsed, the first press in the series is turned down, *i.e.*, the pressure is turned off and the ram allowed to descend, the cakes being removed, one by one as the ram descends, and fresh charges of meal introduced wherever a cake is removed. As the cakes are removed from the presses by the pressman, they are placed on the paring machine or on a table near the paring machine. The parer then strips off the bags from the cakes, and pares the oily edges away from them by means of the paring machine, these oily parings being reduced to meal again and returned to the kettle to be again worked up. The pared cakes are placed in racks, in which they are allowed to stand until perfectly cool, when they can be removed to the cake-house or store, to be stocked or delivered to customers, as occasion demands. The cake

racks are usually allowed to stand in the most draughty part of the mill to assist the cooling process.

' Cotton-seed.—Cotton-seed is divided into two classes: black seed and white seed, the former having its husk quite clean and free from adherent cotton, as for example, the Egyptian cotton-seed. The husk of the white seed is covered with short cotton fibres, as in the case of the American and Indian seeds. Both classes of cotton-seed are treated practically in the same way as linseed, with the exception that after the seed leaves the rolls or crushers, it is still further treated under the large edgestones before being passed on to the kettle. This extra treatment under the stones is for producing a better looking cake, but the yield of oil is not improved thereby. In the United States generally, and other parts of the world, the cotton-seed is not treated in this way, but is first decorticated, *i.e.*, the husk of the seed is entirely removed, the resulting kernels or meats only being treated in the pressing machinery. A mill using decorticators will treat double the amount of seed that a mill of the same size, but without decorticators, will treat, as practically 50 per cent. of the seed is husk.

' Castor-seed.—This seed is usually worked twice, the first time cold, and the second time hot. For the first pressing, it is usually desired to extract the best cold-drawn medical oil. When this is the case, care should be taken that the seed is well cleaned before going to the press. The first pressing should take place in cage presses, the seed being worked up in its natural state without any previous treatment, except cleaning, the seed being fed to the press whole, without preliminary crushing of any sort. No heat would be given to the material beyond that due to the atmosphere. After the first pressing, the resulting solid material would be ground up in suitable machinery and pressed again in cage presses, suitable for a greater working pressure than the presses for the first pressing; or, this second pressing may be conducted in the Anglo-

American presses, according to the process already described.

'*Copra*.—This material is usually crushed twice, owing to the trouble in making sound cakes when pressed once only, and also on account of the large amount of oil it contains. The copra should first of all be passed over a magnetic machine to remove all pieces of iron from the same. After this has been done, the copra would be passed on to another machine for the first reduction, and from this machine to the Anglo-American rolls. From these rolls, the rolled copra would then be taken automatically to the kettle or heater in connection with the presses for the first pressing, which may be either Anglo-American or cage presses. This kettle would act either as a collector and distributor if the material is to be worked cold the first time, or as a heater, collector and distributor if the material is to be worked hot for the first time. From the kettle, the material is passed on to the presses for the first pressing, the resulting cakes being ground up either under stones, in disintegrators or by other suitable means, before passing to a kettle to be heated for the final pressure, which, in this instance too, may be either Anglo-American or cage presses.'

So far as I have been able to ascertain the same, I am afraid this new system of oil-seed expression has not yet been largely adopted in our country. I need not point out that this is the best method to adopt for oil separation and Messrs. Marshall, Sons and Co., Ltd., who are, by the way, sole agents in the East of Messrs. Rose, Downs and Thompson, Ltd., will, I am sure, be very happy readily to attend to enquiries, to furnish estimates and plans and generally to supervise the construction of the mill premises and erection of the plant at the site. To give a better idea of the principal component parts of a plant required for the Anglo-American process of seed crushing, I crave indulgence to enter into some further details,

This process was introduced into England by Messrs. Rose, Downs and Thompson, Ltd., after a visit to the United States, in 1873. At first only used for linseed and similar small seeds, it is now adopted for every variety of oil-seed and nut. Since introducing the Anglo-American system of seed-crushing in 1873, Messrs. Rose, Downs and Thompson, Ltd., have erected machinery capable of crushing over three million tons per annum.

The Anglo-American process of crushing oil-seeds and nuts is, briefly, as follows—The material to be ground is fed into the hopper of a set of Anglo-American rolls. These are four, five, or more in number, and may be of ordinary or chilled cast-iron, with a smooth or fluted surface according to the nature of the seed or nut to be treated. In these rolls, the seed is reduced to meal and the oil-cells broken. The ground material is then placed in a 'kettle,' or circular pan, in which it is heated by steam, damped and agitated. The heating facilitates the flow of oil and solidifies any albuminous matter present. From the 'kettle' the material is withdrawn in quantities sufficient to form one cake, and placed in the moulding machine. In this machine the crushed material is measured, shaped, and compressed into a suitable form to be placed in the hydraulic press.

The Anglo-American oil press does away with the use of the costly horse-hair envelope used in the older process of seed-crushing, and although giving a greatly increased pressure and capacity, reduces the weight of the plant used in working a given quantity of seed, and the space taken up by it. The standard size of press has a 16-inch ram and makes 16 cakes, taking a total charge of, say, 320 lbs. of crushed Bombay linseed. Four such presses are generally worked together. The cakes, on being withdrawn from the presses after pressure, are trimmed to shape in a paring machine and placed in racks to cool.

The rolls are compact and entirely self-sustained (Fig.

3.) The shafts are all of forged steel, and have large bosses forged on each end, where they are fixed in the rolls so as to prevent them from coming loose. The roll bodies and shafts are turned very accurately to Whitworth gauges, and great care is exercised in the selection of the materials from which the rolls are cast. The rolls are forced on to the shafts by hydraulic pressure. The seed passes into the hopper in the usual manner, and is distributed to the crushing rolls by a fluted feed roller of the same length as the crushing rolls, placed at the bottom of the hopper. When the seed passes the feed roll, it falls on a guide plate that carries it between the first and second rolls. After passing between these rolls and being partially crushed, it falls on a guide plate on the other side, which carries it between the second and third rolls, where it is crushed more fully. It then falls on another guide plate, which carries it between the third and fourth rolls, where it is ground more fully still; in the larger rolls, it then falls on a fourth guide plate, where it is conveyed between the fourth and fifth rolls, and receives the final crushing. It will thus be seen that the seed has been crushed four times in its passage through the rolls, which are brought in contact by a combination of a screw and spring, which gives a smooth and easily regulated pressure. When the seed falls from the bottom roll, the grinding is much more complete and perfect than in seed that has passed through rolls and under stones of the old construction. These rolls can be constructed to treat any class of oil-seed or nut.

The kettles are made of cast-iron and are constructed in the strongest and best manner. (Fig. 4.) There is only one steam joint in them, and that joint is faced in a lathe, or planed quite true, consequently there is little liability to leakage. The furnishings for the Anglo-American kettles are a damping apparatus with perforated boss, brass tap with indicated plate, gauge, safety valve, upright shaft, stirrer and delivery plate, and improved slide. When lagged, to prevent radiation of heat, the kettle body is

fitted with a wood-frame and covered with felt, and the felt is enclosed within iron sheeting.

Presses.—Four of the heaviest Anglo-American presses, each fitted with plates of wrought iron, steel or cast malleable iron is supplied with each mill for making sixteen cakes about 28" \times 12" each, and from 10 lbs. to 11 lbs. weight as may be desired (fig. 5). The press cylinders are 16" diameter and made of cast steel. These presses are usually constructed for a working pressure on the ram of $1\frac{3}{4}$ tons per square inch and are constructed in the strongest and best manner, great care being taken in the selection of all materials used, and the work is of the highest and exact class. All the columns, cylinders, rams and heads are planed and turned accurately to gauges, so as to ensure that every part will take its due proportion of strain and no more; the pockets that take the columns are not cast, as is usual, with fitting strips, top and bottom, but are solid throughout, and are all machined out of the solid to gauges. This method of treating the pockets has the effect of almost entirely preventing the columns from breaking. In presses of the screwed-column type, the pockets for the columns are bored and the columns are fitted with steel nuts. The plates are all well fitted and have a corrugated surface. If a brand is required to be placed on the cakes, letters about 3" long are clearly cut into one side of the plate, and all the remainder is corrugated. These plates are all made of wrought and cast malleable iron, and the columns are made of best scrap-iron or mild steel. The cylinder is cast steel.

Pumps.—A set of hydraulic pressure pumps works the four Anglo-American presses. They are fitted with stop or distribution valves. These pumps are of the horizontal belt driven type having two 3" low pressure pumps for giving the preliminary pressure and $2\frac{1}{4}$ " high pressure pumps, to give the final pressure of $1\frac{3}{4}$ tons per square inch. The internal strains are all self-contained and massive foundations are not required. The pumps are of massive con-

struction and high-class finish. They are fitted with strong steel crank-shaft, turned from a solid forging, the shaft being carried by three strong carriages, fitted with adjustable brasses. The driving is direct, by means of a heavy fly-wheel pulley keyed on to crank-shaft. A special feature in these pumps is that all valves and joints are above the top of the cistern, thus the joints can be re-made or the valves ground-in from the outside, without stopping the pumps or having to empty the cistern to enable the foot valves, etc., to receive proper attention. The pump cistern is provided with a manhole for cleaning purposes.

Cake Paring Machines. (Fig. 6).—These are of simple construction, and are suited for paring either parallel or taper cakes. They are worked as follows:—The parer strips his cake and lays a number of these on a stool or a table convenient to his machine. He then takes up one and lays it on the machine, having one side parallel to the trough and overlapping it about an inch, one end being pressed against a fence either to the right or left, depending on what stroke the machine is taking. The knife block passes along and cuts one side clean and straight. The cake is now turned over and the other edge of the same is treated in a similar manner. He now turns the cake half round, places one side against a fence and cuts off the oily part at one end, then reverses the cake and does the same with the other end. The cake is now ready for the market, and has been pared by two double strokes of knives, the speed of which is about thirty per minute. When required, fences or gauges are added that give all the cakes one exact length and breadth, but when these are used, more parings are made, as the fences have to be set to suit the worst cakes.

This is the complete machinery required for a modern oil-mill. As occasion may require, this may be supplemented by special machinery required for special purposes peculiar to particular oil-seed proposed to be treated at a mill. Ingenious devices and approved machi-

nery are supplied by Messrs. Rose, Downs and Thompson, Ltd., for meeting almost every possible requirement of an oil-mill, such as edge stones, improved cotton-seed linting machine, linter saw, filing and gumming machine, cotton-seed decorticators, castor-seed decorticators, ground-nut decorticators, disintegrators for treating all kinds of materials, including copra, palm kernels, etc., cocoanut splitting machine, hydraulic filters, centrifugals, and many other exceptionally meritorious devices. Much as I would like to describe all these machines, I regret that want of space prevents me from doing so. I cannot leave the subject, however, without describing their cold-drawn system of oil pressing by which the substances operated upon are treated under pressure in finely perforated containers, which, while retaining the solid residue, allows the oil and other fluid to escape. The increase in the production of oil from very oily seeds and nuts, such as castor and copra, which require double pressing, has caused a renewal of the demand for these presses. To meet this, Messrs. Rose, Downs and Thompson, Ltd., have designed the 'Premier' press, an illustration of which is here given. (Fig. 7). Regarding this, they say : For many years we have made oil and other presses in which the solid material was treated in a perforated metal box under pressure, the oil or other fluid escaping through the perforations. The method of working is as follows:—The kettle is filled with seed, which is agitated, heated and damped if necessary. In the bottom of the kettle are two openings corresponding to two chambers in the heads of the presses. These chambers contain enough of the ground material to form one cake ; they are closed at top and bottom by slides actuated by levers. In filling the press, the workman withdraws the sliding blocks shown between the press head and cake cylinder by the rack and hand-wheel. The press ram is then pumped up nearly to the top of the cylinder, leaving room for the crushed material required to form a cake. The workman then opens the bottom slide of the chamber

in the press head, allowing an accurately-measured charge of meal to fall into the cake cylinder. He then reverses the lever, which closes the bottom of the chamber and opens the top to the material in the kettle, from which it is filled. While this is being done, he places a circular metal plate on the charge of material already in the cake cylinder, and goes on repeating this series of operations until the press is fully charged. The fall of the ram is so controlled as to suit the speed of the workman filling the press. When the press is filled, the sliding block is run forward and the hydraulic pressure applied. When one press is filled the workman proceeds to empty the other, the process being as follows :—the pressure is taken off for a few seconds so as to release the sliding block, which is then run back. The pressure is again applied, and the cakes and intervening plates forced out of the cylinder. These are removed in blocks of three or four by the attendant, who separates and stacks the cakes for further treatment, returning the plates to a position convenient to the workman who fills the press. It is generally intended that the cakes produced by these presses should be again reduced to meal by edge-stones or other means, and repressed on the Anglo-American principle.

In concluding this subject, I have much pleasure in giving here the illustration kindly lent by Messrs. Marshall, Sons & Co., Ltd., showing how the various component parts of a complete oil-mill described above should work. It is modest plant and is designed to be worked with bullock power. (Fig. 8.)

Messrs. Jessop and Company, Limited, engineers and owners of the Phoenix Iron Works at 93, Clive Street, Calcutta, have cordially furnished me with much important information regarding their No. 1 Imperial Oil Mill, a neat compact machine, which they consider the best plant on the market for use in villages. (Fig. 9).

The capacity of the mill, as stated by a mofussil constituent of Messrs. Jessop & Co., Ltd., to whom one was

supplied recently, is 27 maunds of mustard-seed between 6 A.M. and 4 P.M., with an interval of one hour. The machine is driven by belt from a 6 N. H. P. Steam Engine (4 N. H. P. would be sufficient, but it is well to have a margin of power). The first operation, that of grinding the seed, is accomplished by a set of Anglo-American rolls, four in number, made of chilled cast-iron of great hardness, 8 inches dia. and 8 inches wide. After passing through the rolls, the seed is 'cooked' in a kettle for about 10 minutes, the kettle being kept at the correct temperature by means of steam from the 8 N. H. P. boiler, which also supplies steam for the engine. After being cooked, the seed is put into a mould, which is supplied with the machine, of suitable capacity, for the press and moulded into cakes which are wrapped up in woollen bags preparatory to being pressed in the hydraulic press. The hydraulic press is made to take ten of these cakes at once, each cake weighing about $3\frac{1}{2}$ lbs. before and $2\frac{1}{4}$ lbs. after pressing. The pressure usually exerted is 2 tons per square inch but this can be varied at will. The oil as received from the press may be put into bottles or barrels, without any preliminary straining or purifying operation. The manager of the mill estimates that he gets from 3 to 5 per cent. more oil from the seed by using this mill than from the old process of using *ghanies*.

The price of a complete mill, complete with engine and boiler, a supply of bagging and usual accessories, is approximately Rs. 5,000.

The cost of running the mill may be estimated from the following approximate figures :—

1 Foreman	...	...	Rs. 35 per month.
1 Mate	...	...	„ 15 do.
2 Coolies	...	...	„ 8 do.
Coal required	...	...	$1\frac{1}{2}$ cwts. per hour.

A woollen press bagging 1-lb. will make about 3 bags and each bag can be used about 8 times.

The profit to be obtained of course largely depends on the cost of seed and the price obtainable for the oil and cakes but each intending purchaser will be able to work this out for himself.

Messrs. Jessop & Co., Ltd., undertake to supply these mills with a larger capacity but for village use they do not think there is anything to beat the compact, cheap and efficient plant just described.

Messrs. Macbeth Brothers and Co., Engineers, of 12, Mission Row, Calcutta, quote their lowest price for Mr. Robert Middleton's (Sheepscar Foundry, Leeds, England) Independent Anglo-American oil mills, capable of crushing about $3\frac{3}{4}$ cwts. of seed per hour at Rs. 6,900 nett, delivered in Calcutta. The cost of an Engine and Boiler to drive the above mill would be, I am told, Rs. 2,000.

This machinery consists of the following :—Elevator, with cast-iron hopper, malleable-iron chain and stamped steel buckets for elevating the seed from the floor to the rolls ; Seed Rolls, with best chilled cast-iron rolls fitted on steel shafts, cast-iron sides, adjustable feed hopper, steel scrapers, dust casing, and belt Pulleys ; another Elevator as above, for raising the meal to the kettle ; mild steel Kettle, steam jacketted on sides and bottom, fitted with heavy driving gear, steel shafts, stirrer, adjustable steam spray, pressure guage, steam and drain cocks, and covered with non-conducting material and cased with sheet iron. It is also fitted with improved outlet for the meal worked by the strickling box ; Anglo-American oil press, with gun metal or forged steep stop valve ; Pumps, constructed of forged steel with gun-metal or steel rams, suction and delivery valves, low pressure knock-off valve, and high pressure safety valve ; Cake Parer and Reducing Mill ; Settling Tank with divisions, for collecting the oil from the press ; Rotary Pump, with suction pipe from the settling tank. (Fig. 10).

The Rolls, Kettle, Pumps and Main Shaft are carried on a massive cast-iron foundation plate. The gearing is self-contained and a main driving pulley is provided for

connecting it with to the motive power. All the necessary pressure and return piping, pressure gauges, belts, foundation bolts, and screw keys are also supplied.

I am glad to be able to say that other well known engineers also kindly promised to furnish me with information, but I regret that I have not, up to the time of going to press, been favoured with their valued suggestions. I hope, nevertheless, that the information that I have been able to collect, as set forth above, will at any rate be considered sufficient to interest probable promoters of would-be mills and to serve for them as a handy introduction to the subject.

3—THE EXTRACTION OF OIL.

A successful competitor to the old process of pressure expression has, of recent years, appeared in the field of oil-separation in the shape of the employment of the agency of chemical solvents to extract the oil from the seed. Even the most modern process of expression of seed for obtaining the oil, is incapable of denuding it of the whole of its oil contents; about 10 per cent. of the oil is left in the finished cake. By the application of chemical solvents, it is possible to extract up to about 98 to 99 per cent. of the oil in the seed. After the oil-cake leaves the press-house, it can be treated with chemical solvents to yield the portion of the oil it still retains. For non-edible oil-cakes, this supplementary treatment may be specially recommended to save the enormous waste the country is constantly suffering. As has already been pointed out, the presence of oil in the manurial cake does not in any way enhance its value as such, although the retention of a small percentage of the fatty constituents in edible cakes may have good points to recommend it as cattle-food.

The solvents that are used in the process of extracting the oil from the seed or the unexhausted cake are, (a) Bisulphide of carbon (CS_2), (b) Spirit of petroleum, called Benzine and (c) common Ether, not in use.

(a) One Jesse Fisher of Birmingham first introduced the use of bisulphide of carbon as a solvent of oil in the year 1843. The bisulphide boils at 46°C . and is easily separated from the fixed vegetable oil, which has a much higher boiling-point, by simple fractional distillation. The seed or the cake proposed to be treated is first bruised and placed in a hermetically closed specially constructed cylinder, into which the bisulphide of carbon is admitted through pipes and allowed to work on the meal. By special arrangement of the plant, the meal is passed from one such cylinder to another to be treated with a fresh supply of the bisulphide and this process is repeated three or four times, by which time the meal is almost entirely exhausted of its fatty constituents. The bisulphide, fully saturated with the oil, is then passed on to a suitable distilling apparatus where the oil and the bisulphide are separated by the application of heat. The drawback of the use of bisulphide of carbon as a solvent of oil is that, it being a solvent also of the resinous and gummy matters present in the seed or the cake, the oil-product yielded by its agency acquires a high colour and sharp taste, while traces of sulphur of the bisulphide are retained in the oil and gives to it, as well as to the exhausted meal, a very disagreeable odour and serious tarnishing properties to render the oil somewhat, if not quite, unfit for culinary, soap-making, or painting and such other principal uses of the oil. It, therefore, becomes quite compulsory to let the oil, extracted by the agency of this solvent, to undergo an elaborate process of refinement and filtration before being placed on the market.

(b) Such, however, is not the case with the other solvent, *viz.*, benzine or benzol, which is not a solvent of gum and resin and does not take any of the colouring matter of the seed or the cake. The oil produced by the use of this solvent, consequently, is remarkably pure and free from all objectionable substances. The method of extraction is more or less similar to that adopted in the case of the bisulphide solvent.

I have not been able to discover any instance in India where extraction of oil by the agency of chemical solvents has as yet been attempted. That the project is full of bright prospects, will appear from the estimates that I have obtained from Messrs. Macbeth Brothers and Co., Calcutta.

I may be permitted here to quote from the extremely interesting remarks, pertinent to the subject I am on, recently made by Mr. Louis Hoffmann, chemist and oil-mill engineer, (whose Calcutta address is care of Messrs. Macbeth Bros. & Co.) in the *Indian Trade Journal*, Vol. XI, pp. 223, 224 :—

‘The manufacture of oil-seeds and the treatment of oils for various purposes is still in its infancy in India. I will not go as far into antiquity as to dwell upon the “Checkao” mills of the Coromandel Coast, but point at the plants in working operation in Calcutta, called *ghanies*. What a waste of money, material, labour, steam! We see a large area covered with some hundreds of revolving pots, each holding but a few pounds of seed. Apart from the considerable cost of such a large plant, the repairing and labour runs into large figures. A powerful (of course non-condensing) engine is the moving spirit in the show. The whole place is dirty and greasy and looks anything but like a mill. The oil oozing out at the bottom of the grinding pots is led into a small tank to be sold in its crude state. I have seen one native concern called an oil-mill and I do not yearn to see another.

‘There are also mills worked by Europeans for the purpose of crushing linseed. Even in these, I noticed a great indifference as regards saving labour, cleanliness, and working on modern lines. It seems to me that it is rather a question of getting through a larger quantity than the plant is supposed to do, than of making a profit by careful work. No wonder that linseed crushing does not pay! What a difference between the plants at present in use as compared to the latest extraction plant by chemical

solvents ! This plant—suitable for treating oil-seeds, oil-cakes, fish bones, etc., say 400 tons per week—consists of a “battery” of 5 extracting pots, each capable of holding about 3 tons of the material to be dealt with. The shape of those pots is cylindrical and they are arranged vertically in one line. The seed passes through a pair of horizontal rollers and is carried up by an elevator and thence conducted by a conveyor over the “battery.” It drops through the open manhole into the pot and, when full, the former is tightly closed and the operation begins. In order to ensure perfect extraction, it is paramount that the material to be separated from the oil is perfectly dry. Fresh seed or cake always contains a certain amount of moisture which must be removed, as the tiny water-cells prevent the benzine from attacking and solving the oil-bearing cells. Some makers of extraction plants of ancient date, dry the material in a drying apparatus, which, apart from the cost of the plant, increases the cost of steam, and yet seldom secures perfect drying, because the size of the drying plant is generally inadequate to deal with large quantities in a short time. Hence this money is mostly thrown away. Other makers do not even attempt to dry and the result is unsatisfactory extraction. This difficulty has been solved by a new patent (Middleton-Hoffmann’s) in a very ingenious and yet simple way and the drying and extracting proceed at the same time.

‘From an elevated benzine tank, the solvent is led down into the bottom of the extracting pots. Inside each pot is a steam coil. As soon as the liquid benzine touches the pipes, it evaporates and the gas penetrates the crushed seed. In about an hour, the vapour works its way right through the whole pot, continuously condensing and evaporating the whole time, until the whole of the contents is uniformly heated from 105° to 110°C . During the condensing, a certain percentage of oil is solved which collects at the bottom of the extractor ; and, while the heated vapour rushes through the seed, every trace of moisture is removed

and carried up with the solvent vapour to be liquefied again in the condenser and separated from the solvent by means of a separator acting upon the different specific gravities of water and benzine. In this single operation, about 80 per cent. of oil is extracted. As soon as the condensing of the vapours begins, which is a certainty that the drying is complete, the liquid benzine-pipe, leading to the bottom of the extractor, is closed and the solvent tank is connected with the *top* of the extractor, letting the solvent run *down* through the warm crushed seed. The oil left in the seed is rapidly and completely dissolved and carried down towards the bottom of the extracting pot. Other makers of ancient plants now draw off the solution and distil the benzine until the extraction is finished. The great fault in this system is that during the greater portion of the process, 90 to 98 per cent. of benzine has to be distilled in order to obtain a few per cent. of oil. Loss of benzine and steam is the natural consequence.

Another feature of this new plant is that the solution is conducted from the first pot into the second, where the benzine is allowed to be thoroughly saturated before it is drawn into the still for distillation. This concentrating process is continued by coupling on the third and fourth pots. Meantime (for about three hours), fresh benzine having continuously been playing on the first pot, there is practically no oil left in the seed. In order to get the liquid benzine out of the seed, the steam oil is again heated and forces the liquid benzine to evaporate. The live steam is introduced which carries along the benzine vapour; and, as the seed is above 100°C ., the steam passes through without condensing. This finishes the process. The manhole above the bottom plate is then opened and the perfectly dry; odourless meal is removed. The other pots are treated in the same way and an ideal extraction is obtained.

“The extracting process lasts from four to six hours according to the oily contents of the seed. The principal matter is the selection of the right quality of solvent, as

many failures are traced to the purchase of cheap and unsuitable benzine. The advantage of extraction by solvents are said to be: (1) Unfailing yield of the whole of the oil contained in the seed, and independence of the vagaries of workmen. (2) Cheapness in working compared with the pressing system. Four hands suffice to work the largest plant; and the loss of solvent should not exceed $\frac{1}{2}$ per cent. on the weight of the material treated. The cost per ton of seed treated is said to be about Rs. 3 against Rs. 13 by pressing. The meal and the oil are perfectly free from the smell of the solvent, and the oil is bright and clear. The meal is perfectly dry and is saleable immediately after being bagged. The cost of an extraction plant is said to be about one-third of the price of the usual pressing plant.'

The cost of complete plant mentioned in Mr. Hoffmann's remarks, including Engine, Boiler, Pump and Seed Cleaning and Crushing Machinery is estimated to be Rs. 75,000 delivered in Calcutta. The plant is capable of dealing with about 50 tons of seed or 60 tons of cake during 24 hours, leaving about 1 or 2 per cent. of oil in the cake only.

It has been calculated roughly that a daily profit upwards of Rs. 1,000 can be made, if the mill is properly supervised.

The estimate and specification of a plant to extract 50 tons of seed (ground) or 60 tons of ground cakes per day, by chemical solvents, kindly supplied to me by Messrs. Macbeth Brothers and Company is as follows:—

1. One special plant to refine ordinary benzine to a uniform evaporation point of 100° C. £ 165 0 0
2. Five coupled extractors, each of 4 cubic metres contents, between manhole and perforated plates, holding about $2\frac{1}{2}$ tons of seed or 3 tons cake-meal. The extractors complete with steam-coil on the bottom for open

and close steam, with mechanical stirring arrangement, shaft and cog-wheel on top. The perforated plates with filtering-material between. With all valves, pipes, complete, including special bubbling trap to prevent meal being blown into condenser.

3. Two condensers of 40 square metre condensing pipes surface each, complete with all connections.
 4. One separator to separate the solvent from water.
 5. One solvent reservoir with glass gauge, all valves and pipes complete.
 6. Two stills with dome to prevent oil being evaporated, with steam coil for close and open steam, all valves and pipes complete. Price of the above machines, delivered F. O. B., English port £ 3150 0 0
 7. One solvent pump £ 50 0 0
- (In case it is desired that the condensers should be placed on the ground instead of above No. 5 reservoir, one extra pump is required costing £50)

Buyers to supply the necessary steam of about 14 lbs. pressure (1 atmosphere), one elevator, the bins on top of extractors and conveyor; also one water pump for condensing purposes.

It is advisable to put along the ground-floor, one conveyor to collect all the meal from the five extractors and one elevator to the bagging room.

The following guarantees will be given:—

(1) The loss of the solvent not to exceed about 1 per cent. on the weight of material treated, subject to sufficient condensing water being available. The plant will be put up by sellers by their own fitter, who will show the work-

ing process for one week, teaching the coolies how to handle the plant. The guarantee is fulfilled as soon as, in the presence of buyers' delegates, a trial-working of 50 tons is performed and the measure of benzine before and after the process is ascertained not to exceed about 1 per cent.

The fitter's voyage out and back home, and daily expenses to be paid by buyers.

(2) The oil left in the meal not to exceed $1\frac{1}{2}$ per cent. The guarantee is fulfilled by analysis on the spot, in the presence of buyers.

(3) Oil and meal to be entirely free from any smell of benzine, the meal to leave the extractor dry (without drying afterwards being necessary) and marketable.

REFINING PLANT, TREATING 5 TONS OF OIL.

Mixing Tank, lead lined, with air pipes (of copper), coming bottom and top.

Bleaching and refining tank of wrought-iron, with steam and air pipes and large steam coil for heating the oil.

Rotary oil pumping the crude oil into the mixing tank.

Double acting air-pump, belt driven. The necessary pipes to connect all the parts inside the refinery.

Mucilage tank of wrought iron. Price, delivered F. O. B. British Port, one each, £ 505 0 0

With the kind co-operation of Messrs. Macbeth Bros., & Co., I have been able to get up a working programme of a chemical extraction oil-mill. The results arrived at, as will presently appear, are promising enough to justify the recommendation of, at any rate, a trial being given to this process, quite new in our country.

Let us proceed to consider the prospects of a mill with a capacity daily to work, say, 50 tons of seed or 60 tons of cake by the process of chemical solvent extraction.

To start with rape-seed cake, we find it contains, on an average, about 12 per cent. of oil. Taking the price

of a ton of the cake to be £4, and the price of the oil at £25 per ton, we arrive at the following result :—

Cost :

60 tons of cake ...	...	...	...	£240
Extraction @ 5s. per ton...	...	...	...	£ 15
				<hr/> £225

PROCEEDS :

12 per cent. oil @ £25 = 7·2 tons =	£180 0
85 „ meal @ £4·10 = 51 „ =	£229 10
	<hr/> £409 10
Less Cost ...	£225 0
	<hr/>
Daily Profit ...	£154 10

The oil refined fetches at present in the London market £30, in Germany £35 and in Austria £35 (duty to be deducted). *Mowha* cakes can also be treated same way.

Turning to the treatment of seeds, we arrive at equally bright prospects. The price of rape-seed in April and May last was Rs. 5-8 per maund, or in other words, about £10 per ton, to which, if we add the working expenses of 5 shillings per ton, we have £10-5 as the total of the cost of production. The price of the minimum 40 per cent. of oil-yield, at £30 per ton, will bring in £12-0 and the 50 per cent. of the exhausted meal at £4-10 will bring £2-14, making together £14-14, from which, when the cost of production, namely £10-5, is deducted, there is a clear profit shown of £4-9 per ton of seed treated. This means a daily profit of £222-10, when the mill treats 50 tons of seed per diem. The oil from the seed could be made edible to suit the Indian market or for export abroad. Similarly, consider the figures given below representing the probabilities of the treatment of *Mowha* seed :—

Cost :

Rs. 2-4 per maund = £ 5 0 per ton.

Working ... £ 0 5

£ 5 5, or £262-10, for 50 tons.

PROCEEDS :

47 per cent. oil @ £25 per ton = 23'5 tons =	£ 587	10
50 „ meal @ £2 „ = 25 „ =	£ 50	0
	£ 637	10
Less cost ...	£ 262	10
Daily Profit ...	£ 375	0

The *Mowha* oil can be made edible and be used as a substitute of *ghee* or equal to cocoanut-butter. In this case, a special refining plant is necessary, and the price of the oil is enhanced to about £40 per ton, increasing likewise the profits of manufacture:—

PROCEEDS :

45 per cent. (deducting loss) of oil =	225 tons @ £40 per ton =	£ 900	0
50 „ meal £2 per ton =	25 tons @ £ 2 per ton =	£ 50	0
		£ 950	0
Less cost (vide ante) ...		£ 262	10
Daily Profit ...		£ 687	10

Another chemical process of treating the *Mowha* seed is recommended and it consists in chemically and mechanically splitting up the component parts of the oil into (a) fatty acids, and (b) glycerine. A special plant is required for the splitting and distilling the fatty acids and refining the glycerine. Dealing with 235 tons of the seed by this process, about 94 per cent. of fatty acids and about 10 per cent. of glycerine is obtained, which results work out as follows:—

PROCEEDS :

94 per cent. of fatty acids = 22'09 ton =	£ 662	14
10 „ of glycerine = 2'35 „ =	£ 117	10
	£ 780	4
Plus meal—	£ 50	0
	£ 830	4
Less cost—	£ 262	10
Daily profit—	£ 567	14

The fatty acids are a perfectly white, hard fat equal to cocoanut oil in appearance and better than the latter for soap manufacturers because they can treat this fat with cheap carbonate of soda instead of the high-priced caustic soda. It is also superior to cocoanut oil, because its saponification is perfect, it takes and keeps *more water*, thus cheapening the soap. Beside, there is not the usual loss of glycerine water, which is usually wasted by our soap-makers by using copra-oil. *Mowha* fatty acid is equal in value to Palmkemel oil imported into England and America from Germany, and can be sold in any quantity. The glycerine is perfectly refined for nitro-glycerine or for being used medicinally, the latter quality fetching from £60 to £65 per ton. It will thus be apparent that the profits shown to be made in the three several processes of working *Mowha* mentioned above, namely £375, £687-10 and £569-14 work out at a probable average daily profit of about £510 per day.

If we now turn our attention to cotton-seed, we find that 60 tons of the seed, daily treated, is capable of yielding about,—

6 tons of prince sweet oil	@ £ 30 per ton—£ 180
3 tons of ghee-substitute	@ £ 40 per ton—£ 120
42 tons of powdered cake	@ £ 4 per ton—£ 168
0'6 tons of cotton-waste	@ £ 15 per ton—£ 9
8 tons of dust for manure	@ £ 1 per ton—£ 8
	<hr/>
	£ 485

Less cost of seed @ £4 per ton, 60 tons, £ 240

Cost of working @ 5s. per ton £ 15 £ 255

Daily profit £ 230

The question of giving the results of other oil-seeds or nuts is a mere matter of calculation. The cost of the whole plant, including the machinery required for the extraction, pressing, refining, splitting, etc., has been quoted at £20,000. It remains for me to leave the calculation of

the profit and loss on the capital account, which is only self-evident from the figures given above.

4—Conclusion.

I trust I have been able to present a concise, yet an interesting, survey of the subject of the expression and extraction of oil. I feel convinced that anybody who will be pleased to devote his attention to the subject will at once join with me in concluding that this industry is still in its incipient stage in our country, that it has a very bright future before it and that something should be done to give to this industry the healthy support and succour it so much requires for its gradual development in our country. Let us seriously and coolly realise the amount of benefit that will accrue to the country if we ourselves can express or extract, on the modern economic basis, near about 13 crore rupees worth of oil-seeds amounting to 20 million hundredweight that we annually export from our shores! One word more, and I have done. My friends often ask me,—‘What is the return you expect for the trouble and expense you incur regarding matters industrial you are so keen upon?’ For a person of my small resources, the production of a review, ever so humble and unpretentious such as the present one, entails, no doubt, a great strain on the brain and purse. I quietly reply to my friends that the only recompense I deserve and desire is the interest I am able to create in the subject among my countrymen. But then, actuated by the sharp hankering after and expectation of selfish remuneration,—and, who does not want wages for work done?—I sometimes ask myself,—‘Shall I ever receive the compensation for my labours?’—Will my meagre efforts succeed in evoking the interest I desire?’ These are questions I find myself entirely incapable of answering; my countrymen alone are able to do so. Work is judged by its worth; and even my modest work shall be judged by the good it might lead to. It will truly be a

day of great congratulation for me and I shall consider myself, indeed, exceptionally fortunate, when I learn that but a single individual among my countrymen has, on perusal of this paper, been persuaded to take, if only one step forward towards the fulfilment of the object I have in view and the realisation of the ideal I so fondly cherish.

AN OPENING FOR SMALL DYE WORKS IN BENGAL.

BY E. R. WATSON, ESQ., M.A., B.SC., F.C.S.,

Member of the Society of Dyers and Colourists ;

Professor, Dacca College, Dacca.

Having had occasion to consider the question as to what chemical industries would stand a chance of successful development in Bengal I have formed the opinion that at the present juncture the dyeing industry carried on in comparatively small factories offers every prospect of considerable success.

At present very little dyeing is done in the province, a little is done in the bazaars and a little in some of the cotton mills, in the latter chiefly turkey-red or indigo yarn for the edges of dhoties, but practically all the dyed goods used in the province are imported from Europe. The Calcutta import trade in dyed yarns, dyed and printed cloths, is enormous. The question naturally arises 'would it not be possible to dye country-made yarn or cloth to take the place, to some extent, of these enormous quantities of imported dyed textiles' or might it not even be possible to dye at a profit yarn or cloth imported in the grey condition? One would naturally think that if this class of work offered any considerable prospects of success it would be taken up in the cotton mills. And probably this will, in the near future, be done. Several Bengal mills are now extending their operations in this direction. Naturally at first such mills would confine their efforts to the simplest class of work such as the production

of coarse yarn and cloth, and the more elaborate class of work would only be taken up later.

But the development of mills run by European capital does not, I believe, possess any very great interest for that large section of the educated Indian community which is now taking a keen interest in the industrial development of the country and looking for a field in this direction for the application of their energies. The managers of the large mills do not show any tendency to employ Indians in positions of responsibility or for any work except mere labour.

This section of the Indian community to which I have referred, is also faced by the difficulty of raising capital to attempt for themselves any industries involving a considerable outlay in buildings, machinery or other plant, and consequently any industry which offers a prospect of successful development in small factories with only a small capital outlay is of special interest at the present time. In the present paper I propose to give my reasons for supposing that the dyeing of yarn and cloth and calico-printing could be taken up with success in such small factories, say in small factories with a capital of not more than from Rs. 50,000 to Rs. 1,00,000.

I hope that in the near future the Government of Bengal may start classes in Dyeing and the Chemistry of Dyeing and may also attempt a demonstration of the feasibility of small Dyeworks by itself starting such a small factory, in the same way as the Government of Madras has demonstrated the possibilities of chrome-tanning in a small factory in Madras.

I have characterised the imports of dyed and printed goods into Calcutta as enormous, let us look at some figures to see the actual amount. The following are taken from the Annual Report of the Trade and Navigation of British India for 1904-5 and are the returns of dyed and printed cotton goods imported into Calcutta. This year was not abnormal in any way and these figures may be taken to indicate the amount of the annual trade—

ARTICLE.	QUANTITY.	VALUE.	VALUE PER UNIT.
		RS.	In Rs.
TWIST AND YARN.			
Orange red and other colors	Nos. 1-20 149,575 lbs.	1,11,608	'74 p. lb.
Ditto	" 21-25 1,840 "	1,200	'65 "
Ditto	" 26-30 119,950 "	86,576	'72 "
Ditto	" 31-40 3,981,374 "	30,12,544	'75 "
Ditto	" 41-50 750 "	570	'76 "
Ditto	above 50 8,640 "	11,010	1'27 "
PIECE-GOODS (bleached).			
Cambrics, Twills, Muslins and Lawns	... 3,747,714 yds	7,22,511	0'19 p. yd.
Chadars, Dhuties, Saris and Scarves	... 43,036,448 "	59,08,230	0'14 "
Checks, Spots and Stripes.	973,925 "	1,58,930	0'16 "
Drills and Jeans	... 2,131,632 "	4,97,849	0'23 "
Jaconets	... 15,969,175 "	27,74,848	0'17 "
Longcloths	... 825,941 "	1,88,084	0'22 "
Mulls	... 46,400,772 "	66,75,005	0'14 "
Nainsooks	... 52,511,681 "	69,62,270	0'13 "
Shirtings	... 18,807,487 "	30,88,550	0'16 "
Unspecified descriptions..	4,771,178 "	7,24,914	0'15 "
PIECE-GOODS (colored, printed or dyed).			
Cambrics, Twills and Muslins	... 18,118,815 yds.	23,15,709	0'12 p. yd.
Chadars, Dhuties, Saris and Scarves	... 16,303,206 "	34,83,378	0'21 "
Drills	... 658,943 "	1,64,901	0'25 "
Jaconets	... 487,023 "	85,575	0'17 "
Mulls	... 314,713 "	40,626	0'13 "
Prints and Chintz	... 31,321,113 "	50,20,038	0'16 "
Shirtings	... 33,053,199 "	45,85,933	0'13 "
Unspecified descriptions ...	28,493,276 "	74,15,197	0'26 "
Handkerchiefs, shawls in ... the piece	... 2,433,905 No.	11,47,595	

Noting a few of the important items we may say there are more than Rs. 30 lakhs worth of dyed yarn imported, about Rs. 2½ crores worth of bleached piece-goods, about Rs. 1½ crores worth of dyed piece-goods and Rs. ½ crore worth of printed calicoes. If the local dyer could put these goods, of a proper quality and finish, into the Calcutta market at a less price than the European firms he would of course capture the trade, and with such figures as these there would be no fear of insufficient scope for a long time to come.

A point which now arises is whether dyed goods fetch an appreciably better price than goods of the same quality in the grey or natural state. Whether, in fact, the dyeing of these goods is a profitable part of their production or whether it is merely a sort of finish which is put on, not for the sake of profit, but merely to make the goods sell. Again I will refer to the published statistics in the Annual Report of the Trade and Navigation of British India. For the same year I have worked out, from the figures of quantity and value, the value per lb. of the various counts of yarn, imported 'grey' on the one hand, coloured on the other.

Count of Yarn.		Cost per lb. (Rs.)	
Nos.	Grey.	Coloured.	
1-10	0'52	0'74.	
11-15	0'39		
16-20	0'56		
21-25	0'52	0'65.	
26-30	0'71	0'72.	
31-40	0'68	0'75.	
41-50	0'76	0'76.	
above 50	1'1	1'27.	

In each case, there is seen an appreciable increase in value after dyeing. The average increase is about 1½ annas per lb.

Mr. J. G. Cumming in his 'Review of the Industrial Position and Prospects in Bengal in 1908' says it is calculated that there is a profit of 2 annas per lb. in the dyeing of yarn.

The increase in value after Turkey-red dyeing is, of course, very considerably more than for the simpler kinds of dyeing. We can get an idea of the increase in value in this case from the Market Reports, *e.g.*, *Capital*, Dec. 10, 1908, quotes in its Market Reports—

Grey yarn	40's.	Bannermill	...	As. 5—6
"	"	Wilkinson's	...	As. 5—7
T. Red yarn		...	...	As. 11-9 to As. 14-10.

The average count for Turkey-red yarn will be under rather than over 40's, and we may consider the increase of value in yarn after Turkey-red dyeing to be at least 6 to 9 annas per pound.

For piece-goods the same point may be brought out by a consideration of the following prices quoted from the Calcutta Catalogue of an Indian Cotton Mill.

No. A.	Drill, 28½ inches wide	...	Rs. 0 6 0 per yard.
" 1	" 28½ " "	...	" 0 5 9 "
" 2	" 28½ " "	...	" 0 5 0 "
" 3	" 28½ " "	...	" 0 4 3 "
Can be supplied bleached at		...Rs. 0 0 6 per yard extra.	

Fast Dyed Khaki Drills.

No. 888	Millerained 28 ins. wide	"	0 14 0	"
Warrington	27	"	0 9 6	"
Kitchener	28	"	0 8 0	"
Medium	27	"	0 8 0	"

Coloured Drills

Blue Drill	27	"	0 7 9	"
Red	27	"	0 8 3	"
Miscellaneous	27	"	0 7 3	"

Khaki.

No. A.	Price Dyed	27	"	"	0 7 6	"
" 1		27	"	"	0 7 3	"
" 2		27	"	"	0 6 6	"
" 3		27	"	"	0 5 9	"

from which we may conclude that the average increase in value of drill after dyeing is about 2 annas per yard. Again for Twills.

F. F. F. WhiteTwill	30 inches wide	...	Rs. 0 4 0
Turkey red	" 29 " "	...	" 0 8 0
or an increase of 4 annas per yard after Turkey-red dyeing.			

It may be taken as demonstrated, that the value of yarn or piece-goods is very considerably increased by dyeing or printing.

Of course in the case of piece-goods, there would be some waste of material and labour if goods to be subsequently dyed were sized and calendered or otherwise finished in the 'grey' state, but this waste could, no doubt, be avoided by an arrangement with a local cotton mill to supply cloth straight from the loom without further finish.

For the plain dyeing of yarn and piece-goods, a start at any rate, could be made in quite a small factory consisting of a simple godown for dyeing-house, an engine-house, a dyeing-shed and a compound. The plant would consist of a vertical boiler of some 6 H. P. capacity, some half a dozen rectangular wooden boiling and dyeing vats, 6' x 4' x 6', 9' x 2½' x 2', and so on, fitted with steam pipes for heating, a steaming cylinder about 5 feet long and 3½ feet diameter, two or three dyeing jiggers for dyeing cloth up to 42 inches width, a sizing and mangling machine and drying cylinder for cloth of the same width, a small engine for driving the cloth-treating machinery and a small pump for filling vats, etc., Rs. 50,000 should suffice for setting up such a small factory.

With this plant and some 30 operatives we might dye daily about 250 lbs. of yarn and 150 lbs. of cloth with some simple direct dye, or 200 lbs. of Turkey-red yarn. For *simple direct dyeing* we should require very little in the way of chemicals, say, some 5 per cent. soda-ash for scouring and 3 per cent. dye-stuff and 10 per cent. glauber's salts for the dye-vats.

The following is a rough calculation of yearly expenditure and income :—

Expenditure.

Chemicals.

		RS.
2 tons soda-ash at	Rs. 11-8-0 per cent. ...	460
24 cwts. dye-stuff at	Rs. 120-0-0 per cent. ...	2,880
4 tons glauber's salt at	Rs. 10-0-0 per cent. ...	800

	RS.
Fuel	900
Labour	4,800
Interest on Rs. 50,000 loan at 10 per cent. ...	5,000
Total ...	14,840

Income.

Gross profit on 250 × 300 lbs. yarn at 0-1-6 per lb.	7,030
„ on 150 × 300 lbs. cloth at 0-6-0 per lb.	16,875
Total ...	23,905
Annual profit for management ...	9,065

For *Turkey-red dyeing* the chemicals required form a considerably greater item. The following calculation has been based on the directions issued by the Badische aniline Soda-Fabrik for dyeing turkey-red with alizarine, and the cost has been calculated from the monthly price list of drugs dated October 21st, 1908, in the new number of the *Journal of the Society of Dyers and Colourists*. The prices in India would, of course, be somewhat different, but the lower rates for oil would practically counterbalance the higher rates for imported chemicals.

Expenditure.

Chemicals :—	RS.
Soda ash, 26 cwts at £4-5-0 per ton ...	83
Castor oil, 75 cwts, at £24 per ton ...	1,350
Sulphate of alumina, 122 cwts, at £5-5 per ton..	480
Carbonate of soda, 24 cwts. at £7-10 per ton ...	135
Alizarine 20 ⁰ / ₁₀₀ 5,400 lbs. at -/7 per lb. ...	2,362
Soap 21 cwts at 25/- per cwt ...	394
Chalk 37 cwts at 3 ⁰ 2/- per ton ...	44
Olive oil 6½ cwts at £50 per ton ...	244
Fuel	900
Labour	4,800
Interest on Rs. 50,000 loan at 10 per cent. ...	5,000
Total ...	15,792

	<i>Income.</i>	RS.
Gross profit on 200 × 300 lb. yarn at 0-7-6 per lb.	28,125
Annual profit for management	12,333

These calculations show that there should be sufficient profit in such a small factory to allow the manager-proprietor to pay 10 per cent. interest on a loan of Rs. 50,000 and make a comfortable living for himself. It would probably pay best in such a small factory not to attempt too many classes of work. In Bengal there is a demand for turkey-red and indigo-dyed yarn for dhotie borders, and for indigo-dyed and khaki drill for uniforms for policemen, chowkidars, etc. There would, I have no doubt, also be considerable scope for turkey-red substitutes such as for nitramline red and for indigo substitutes such as naphtiu-done.

For the Calcutta trade many other classes of goods might be produced, *e.g.*, printed calicoes for saris and fancy coloured yarns for weaving patterned cloths. It has often occurred to me that some Government Department in Calcutta, say, the Commercial Intelligence Department, or the Economic Section of the Indian Museum might be of considerable help to would-be manufacturers, if it got together a collection representing the chief classes of goods which find a market in this country together with detailed information as to the demand which exists for each class of goods and the prices at which they sell. I believe that in other countries, *e.g.*, in Japan, a Government Dept., not only collects such information with regard to the home trade but is at considerable pains to place at the disposal of manufacturers the most detailed information as to the class of goods likely to find a profitable sale in foreign markets.

With regard to the dyestuffs to be employed, there is absolutely no doubt that artificial dyestuffs from Europe would be required. For plain dyed goods such as I have

mentioned as finding a market in Bengal very considerable fastness is a *sine qua non* ; and despite what has been said to the contrary from time to time by enthusiastic but misinformed writers on the subject, the vegetable dyes of India are, with very few exceptions, incapable of giving really fast colours on cotton. Nor would it be possible for many years to come to attempt to manufacture artificial dyestuffs in this country.

I have so far said nothing as to the qualifications which a man would require who intended to start such a small factory. At present the training required could not be obtained in Bengal. It is possible it might be obtained in Bombay but it would be preferable to first take a sound general education in this country, which should include some knowledge of science and engineering, and then proceed to Europe. After arrival in Europe it would be first necessary to study in some Technical College, as at Leeds or Manchester in England, and afterwards gain admission to some dye works where the operations could be seen as carried out with all the dispatch and economy necessary to ensure a profit.

These few remarks on a subject which interests me intensely, are offered with all diffidence, as the actual practical experience in running a concern as proposed is wanting, and in such cases, of course, a very little practical experience is worth much more than any amount of opinions hatched from an arm-chair. If the Bengal Government do start a small demonstration dye-house, the Officer-in-charge will be able to revise these few remarks of mine in the light of actual experience and will be able to speak as one who has authority.

My present remarks must only be taken as suggestions inviting consideration and discussion of my proposals.

In the consideration of the amount of materials, labour and fuel required for the handling of a given weight of goods, any person who has been engaged in such operations on any scale in this country would be able to give

information of great value, but, as a rule, such persons prefer to keep their knowledge for their own exclusive use. In this direction the Government might, without any further expenditure, be of assistance to those now desirous of starting various industries, and, no doubt, if asked by any representative association or conference would be willing to do so, *e.g.*, with reference to the present subject, this Conference might ask the Government of Bengal to allow the Officers-in-charge of the dye-houses in their large jails to prepare memoranda, showing the amounts of dye-stuffs and chemicals, fuel and labour required in dyeing a given weight of yarn or cloth by the various processes used in the dye-house under their charge.

**A FEW HINTS FOR THE CONSIDERATION OF
THOSE WHO MAY INTEND TO ESTABLISH
NEW OIL MILLS.**

BY RAO BAHADUR D. V. BHAGAVAT,

Managing Director, Shri Lakshmi Oil Mill, Akola.

At page 25 of the Report of the Second Industrial Conference, held at Calcutta in 1906, there is a tabular statement which shows that whereas in 1895 there were in India 163 oil mills 'carried on mainly by steam,' that number fell to 112 in 1904, at the end of nine years. I have no means to find out the causes which led apparently to the closing of 51 mills in such a short period. But there are a few circumstances, most of them specially applicable to the industry in question, which may explain the failures and which intending oil-millers may do well to keep in mind.

It must be remembered that the business of an oil-miller who uses steam power and carries on operations on a very much larger scale than the ordinary country *teli* with his wooden mill and bullock power, is one which partakes largely of the nature of speculation. This is so because it is necessary for him to buy and store oil seeds

in advance to last for several months. He cannot place dependence (unless his mill happens to be in one of the great port towns like Bombay and Calcutta) on local merchants to supply him with oil seeds as he needs them. Oil seeds are always in much demand in foreign countries and are therefore being continuously dispatched to the port towns for exportation ; so that it sometimes happens that stores of oil seeds held by merchants in the interior of the country are almost or quite exhausted. An oil mill whose consumption of seed is never less than several tons per day cannot, therefore, afford to live from 'hand to mouth,' *i.e.*, look for its supplies to the local markets at all times of the year. It must always keep in store a considerable stock of oil seeds. A supply sufficient to last for four months is considered the minimum which the miller must always have on hand. There is another consideration which compels the laying in of large stores of seeds. Oil seeds are generally most cheap at the time of their harvest. It is, therefore, obviously to the interest of the miller to lay in at this time as large a stock of seeds as his means will permit. For these reasons, it becomes necessary to purchase large quantities of seeds several months before they are actually used and long before the extent of their yield in other provinces of the country as well as in foreign countries becomes known. It is therefore not uncommon that owing to abundant harvests elsewhere, prices fall and seeds become cheaper than they were at the time of their harvest. *Vice versa*, if crops elsewhere are deficient prices rise. All this means risk and hazard to the miller. Thus the miller is not merely a simple manufacturer, he is, besides, a *Speculator*. If the money used by him in the purchase of seeds is his own, his position is comparatively a stable one. But should he be using borrowed money, and that at a high rate of interest, his condition is always one of more or less insecurity.

I have dwelt up to this time on the speculative nature of the miller's business in respect of the raw material which

he uses, but the same considerations more or less apply to the products of his mill, *viz.*, oil and cake. The latter is almost all exported to foreign countries where it comes into competition with the products of other countries. As for oil, it is almost subject to great fluctuations of prices.

Thus an oil miller is largely the victim of fortune. It may not be amiss to give in this place some idea of the quantity of seed, say linseed, which an oil mill of the smallest size, capable of being remunerative, will consume in one year. The No. 5 Colonial Oil Mill of Messrs. Rose Downs and Thompson, Hull, or the No. 2 Anglo-American Oil Mill of Messrs. Greenwood and Batley, Leeds, is considered to be the smallest size of mills which is likely to be remunerative. *Types of mills smaller than the above*, are known to exist in India. But I know of two cases in which such mills had to be closed owing to the excessive cost of working them. Now, the No. 5 Colonial or the No. 2 Anglo-American will consume about 9 cwts. of linseed per hour. Assuming that the mill works 11 hours per day for 300 days in the year and that the price of linseed is Rs. 7 per cwt., the annual consumption of seed would be 9 by 11 by 300, or 29,700 cwts. of the value of Rs. 2,07,900, or say, in round numbers, two lacs of rupees. Since, as has been explained above, the miller must have a supply on hand at all times sufficient to last for four months, the above calculations mean that he must have Rs. 50,000 locked up in seed alone.

About Rs. 30,000 to 40,000 are in addition locked up in stocks of oil, cake, stores and outstanding debts.

The above figures hold good only if the mill is of the capacity of 9 cwts. per hour and works for 11 hours per day. If, however, the size of the mill is bigger or it works day and night, as all oil mills ought to do, the investments in seed, oil, cake, stores, and outstandings will be proportionately greater.

Other causes which may account for failures, are insufficient equipment in machinery and plant, buildings and

stores. In this connection I should suggest that a liberal margin of extra power should be allowed in calculating the capacity of the boiler and engine, when machinery is ordered for the mill. The estimates furnished by the makers of oil machinery, as to the power necessary for operating it, are found, in many cases, to be no safe guides. In any case it is always advisable to possess some excess of power. I know of two instances in which, though the power purchased was in accordance with the estimates furnished by the makers, it was found impossible to operate the machinery with that power. Then again, ample provision must be made on account of godowns for seeds, oil, and cake. Too much emphasis cannot be laid on this point, because in an oil mill the least exposure of the seed or cake to moisture and other injurious influences will cause loss. I would suggest that no new oil mill should be built without previously taking the advice of experts or men of experience as to provision of room and arrangement of the buildings. The proper designing of the buildings is a point of great economic importance, for, if the design is defective, the defects may not be merely the source of future inconvenience, but they may also produce waste, and extra and recurring expenditure.

A third point which must be well considered before constructing a new mill, has regard to its situation with reference to supplies of seed. Care must be taken that the mill is built in a place where seed can always be had in plenty. I know of two mills which had to be closed because the districts in which they were built did not produce enough seed for their consumption.

Lastly, it must be remembered that an oil press is not like a cotton press. The manufacture of oil and cake is an art which is acquired after much experience. A new oil miller therefore must expect to suffer losses from inefficient and bad working in the commencement, unless he is fortunate in possessing expert advice to guide his first steps.

If the suggestions made in this paper are kept in mind, it is hoped that the chances of failure will be much diminished.

THE ALOE FIBRE INDUSTRY.

BY J. N. BANERJEE, ESQ.,

*Late Managing Director, L. P., Fibre Factory of Madhupur,
Calcutta.*

The fibre trade is one which has made quite rapid progress in India, while the field for its expansion is most ample. It is, therefore, much to be desired that it will be still further extended and improved, and that our countrymen will come to participate in it more largely than hitherto. Experience serves daily to bring home to our mind the necessity of utilizing waste lands. In the interior vast tracts are lying fallow, on account of a want of knowledge on the part of the surrounding villagers, as to how to make them productive of wealth. Foreigners come to our country and ransack its wealth, and we, the children of the soil, have no alternative but to submit to the decrees of an inscrutable fate in moulding our destiny.

The object of the present note is, to draw the attention of our countrymen in general, how easily we can amass a large fortune at a trifling cost. The main reasons for not making use of the above industry are as follows :—

(1) The general ignorance about the industry ; (2) the comparative abundance of other species of fibre-yielding plants which can be easily and profitably grown and with whose fibres and with the means of extracting which the people have long been familiar ; and (3) the want of some simple, cheap and efficient machine or appliance suited to their means for extracting the fibre.

The physical description of the plant is a most remarkable one. It grows in all soils (red, black or gravel) throughout India, giving leaves 6 to 9 ft. in length and 6 inches broad, forming bushes or hedge. It is planted

extensively as a protective hedge along almost all the railway lines, and flourishes in the open ground, freely exposed to the sun and unsheltered by trees, shrubs, &c. Experience shows, that where agave or aloe is overgrown with creepers, the plants are unhealthy or when shaded by other trees they are stunted, while those which grow in the open are rich in leaves and luxuriant in growth. It is of several varieties, namely, *Agave Vivipara*, *Americana*, *Ingida Rigida*, &c.

The object to be kept in view at the outset is the extraction of the fibre for export, either in its raw state or worked into yarn or articles manufactured therefrom such as ropes, matting, sail cloth, carpets and other heavy goods besides exceptionally strong paper. The use of expensive machinery for the latter purpose would, of course, not be justified, until the raw material is produced in sufficiently large quantities to warrant the investment of a large capital in such an enterprise.

I have had long practical experience in decorticating this fibre. The following notes are based on such experience.

600 plants to the acre, $8\frac{1}{2} \times 8\frac{1}{2}$ ft. between each row of plants.

20 leaves, annual yield per plant.

Average weight of one leaf, $1\frac{1}{4}$ seers.

$2\frac{1}{2}\%$ yield of fibre, to leaves.

225 maunds of leaves per acre.

5 maunds 25 seers dry clean fibre per acre.

Prime cost of one maund of fibre works at Rs. 6 including wear and tear of machinery, depreciation, &c.

Present sale price in Calcutta, Rs. 12 per maund of machine-cleaned fibre.

Plants can be worked four years from the time of planting out. There are conflicting opinions as to the exact life of this plant. However, this may be, it appears to be not less than 25 to 30 years.

Before, people used to extract fibre in two ways, *vis.*, (a) scraping and (b) maceration, but a machine suited to all classes for extracting the fibre of agave and pineapple leaf and plantain sheath can be had at Rs. 15 and Rs. 50 each. The machine is strong and simple in construction, portable and efficient to easily extract the fibre. A number of these machines may be run by bullock gear or any other power where available. The fibre extracted is uniform in quality and length, and consequently is best adapted to manufacturing purposes and fetches a high price in the market. The working of the machine is so simple that any man can work it successfully by two hours practice.

Now I shall explain two other separate methods for extracting fibre, pointing out the inconvenience one has to suffer.

(a) *Scraping*.—The leaves are cut, the sharp spines removed with a knife and about six inches cut off from the top of the leaf. The leaf is then beaten with a wooden mallet on a smooth stone, the beaten leaves would then be scraped on a board with a blunt knife, water being sprinkled upon it from time to time until the gum or greenish portion of the leaves are removed and only the clean white fibre remains, the board being held firmly by the toes. The fibre would then be dried in the sun and afterwards bundled. The fibre obtained by this process without washing or bleaching, though very clean and free from pulp, cannot fetch high prices on account of its shortness.

(b) *Maceration*.—As in the previous method of fibre extraction the leaves are cut and the spines removed. The whole leaf is then beaten with a wooden mallet and thrown in bundles into a tank (far away from the city to avoid the noxious smell) in which it is left to macerate for three or four months or until the pulps are quite decomposed. The bundles are then taken out, washed as jute, dried and bleached in the sun. The fibre obtained by this process, though longer than that obtained by scraping, is not very clean and hence cannot fetch even nearly half the value.

In conclusion the machine-made fibre is the best which will no doubt help the industry if widely taken up. This is not the time for our countrymen to indulge in mere talk, but to set to work in right earnest to wrest at least a part of the wealth extracted by enterprising foreigners.

I shall be glad to furnish enquirers with any further information on the subject that they may ask for.

THE ARTISTIC TRADES OF THE PUNJAB AND THEIR DEVELOPMENT.

BY PERCY BROWN, ESQ.,

Principal, Mayo School of Art, Lahore.

The industrial arts of India employ an appreciable number of clever craftsmen in various parts of the country and are responsible for a certain amount of commerce. In comparison with other branches of industrial work, however, the numbers of individuals concerned are small, and the trade they represent is of only minor importance. At the same time the art-industrial community is a feature of the country and its sphere of work is in itself of such peculiar interest as to call for special attention. It is a little difficult at times to get the ordinary man of commerce to see this point of view, he regards art, in any form, as a luxury, and the artist, pure and simple, as not a very useful member of society. He toils and spins it is true, but his work at the best is supposed to have no direct influence on the welfare of the country. Some branches of art work give employment to a fairly large number of hands, as for example carpet weaving, but as a rule they concern very small communities, dotted about here and there, and it cannot be said that the development of these, even in a large province like the Punjab, will ever give statistically any important results. The improvement or extension of any one of these art trades brings about no great industrial revolution, gives little or no impetus to the trade of the

province and affects only a little other non-art industries with which it may be associated. In these circumstances the man of business may well ask, whether it is worth while spending time and money over these trades of small profits and still-smaller returns? The friends and supporters of the art industries can then only defend them on the ground of sentiment and tell of the influence the many beautiful art crafts of India have on the lives of the people, the brightness and cheerfulness a decorated article brings into the poor man's home, and the refining effects good architecture, pure ornament and skilful design have on the rich and cultured. Fortunately for the art craftsman, India has this delightful quality of appreciation of the beautiful very strongly developed, and the wonderful art crafts of the country owe their existence and maintenance to this sympathetic view and sentimental feeling which both the rich and the poor alike display almost unconsciously towards them. It is true that two somewhat indefinable influences, namely, taste and fashion, have occasionally stepped in to modify this statement regarding the national character, but this in no way alters the fact that the country appreciates and loves a decorated article and has a great respect and admiration for the artistic efforts of its own people. The universal encouragement of the art industries is therefore of almost vital importance, because their maintenance means the fostering of a very refining feature of life, it constitutes an appeal to the finer susceptibilities of the people to which they have from the very earliest periods of their history most freely responded. It behoves India to treat the art craftsman with more than ordinary sympathy and to support this interesting and deserving community by developing in every way within her power the special trades to which these people devote their hereditary knowledge and extraordinary manipulative ability.

This, then, is the brief for the artistic industries of India. Their history and traditions are well-known but lie behind us in the dead past. With regard to the living

present and boundless future, the country must always remember that these æsthetic trades, small and unimportant individually, are collectively part of her life. The cultivating influences of these have contributed in no small share towards moulding all that is good in the national character.

The object of this paper having been explained, an account of some of the more important of the art industries of the Punjab and any steps that have been taken to develop these may be outlined.

The artistic industry that employs the most labour is carpet weaving, the principal place where this is carried on being Amritsar. As is well known the jails of the Province also conduct a considerable trade in this manufacture. The industry was an indigenous one or at least very much developed in the 16th century owing to the great encouragement given by the Emperor Akbar. With the decline of the Moghul dynasty carpet weaving also declined, and, at the time of the annexation of the Punjab, appears to have become practically extinct. About 1850 a revival of the art took place, mainly due to a desire for Indian goods in Europe and the jails, seeing an opening, took the manufacture up. The market rapidly increased to such an extent that private firms came into existence to meet the demand. This has resulted in the flourishing trade of the present day and the large number of looms that are being worked in Amritsar at this moment. Before criticising the competition of the jails, rather a popular argument at times, one should remember, that it was the enterprise of these that called the trade into being; the jails revived the trade and the private firms have made it what it is. The question that arises is, have these manufacturers made the best of the industry from the artistic point of view? As a matter of fact they themselves admit that they have not, that their designs are not good and that the general artistic character of their productions is not of the highest standard. One has only to look through the show rooms of any of the large firms to see that this is only too true. The

powerfully designed patterns in strong combinations of colours characteristic of the art as developed by the Emperor Akbar are few and far between. Light schemes of colouring, far from oriental, predominate, and the general appearance of the designs is neither of the East nor the West. 'Freak' patterns also are not uncommon, one year what were called 'Egyptian winged globe' carpets were to be seen on many of the looms of the Punjab, and other weird and wonderful creations are occasionally woven into rugs. But it must not be imagined that these are produced on account of the inartistic knowledge of the manufacturer. Far from this, he has, as a rule, a keen appreciation of good patterns and colouring of the approved and appropriate indigenous order and his experience in oriental designs is usually particularly sound. In fact he is only too willing to criticise the productions of his workshop and laments deeply the use of these hybrid compositions. He has to produce, however, according to his demand and here that impossible barrier to all good art work, public taste rises up clogging his movements and binding him down to articles which are far removed from his own ideas of what a good oriental rug should be.

This is, briefly, the state of the carpet industry in the Punjab at the present day. The maker has to take up the line of least resistance and the line that pays. There is no remedy, it can only be hoped that public taste will in course of time, improve and that by the swing of the pendulum the really pure oriental pattern will again come into popular favour. As regards materials and manufacture it is believed the bulk of rugs produced by the better class looms of this part of India is practically as good as of old. Some fleeting dyes and crude colours are still used, and a cheap carpet means a very poor bargain for the buyer, but there is not much to criticise in this direction. One type of rug, owing to want of support, has completely died out within the last ten years and a very inferior and different class of article is produced in its place. This is the white

and indigo cotton rug of Multan, which, it is now quite impossible to obtain. Steps might be taken to revive this trade and also purge out the present gruesome style of manufacture. A scheme for a small technical school taking up two or three of the arts of Multan which require encouragement has been outlined and presented to the authorities, but has not yet been put into effect. It may be mentioned that the Lahore School of Art has supplied on demand several designs to the carpet manufacturers and deputed trained students when required to work in the designing departments of some of the leading firms of Amritsar.

The second largest art industry in the Punjab is probably that of wood working, either carved or inlaid. This craft is carried to a very high state of excellence, and the Sikh workers in this material have a great reputation both as carvers and joiners. The Art School at Lahore, has for over thirty years, conducted a class where the art of wood carving is taught on the most approved lines. Under the control of the most able staff it is possible to procure, the subject has been taken up from both its artistic and scientific points of view, and it is felt, that in this branch of art work some good may have been done to foster the handicraft. Design on the traditional lines has been thoroughly taught; selection and treatment of the wood has been made a speciality, and the proper construction of the article after the completion of the decoration, has been insisted on. The result is, that many students have been sent into the world with a thoroughly sound knowledge of every branch of this craft and the trade is at least as good as if not better than at any previous period. Efforts have also been made to encourage and improve the commercial aspect of the art and the work-people have been placed in communication with their market. It has been found possible to do this in a practical manner on account of the frequent applications made to the school for good examples of its work. These commissions have been passed

on to old students of the school working in the bazaar, with the stipulation that the work must be periodically inspected and approved by the Principal or a member of the staff. The reason of this condition is obvious. It has been found most necessary and at the same time has never led to anything but the most satisfactory results. This system might be developed much more extensively, but apart from the fact that it hardly lies within the sphere of the school, it also needs much labour and time spent outside ordinary school duties. Nevertheless it seems to be a useful step and one that Schools of Art might take up and carry out if the work of those institutions will permit of the introduction of such a scheme. A word may be said regarding the first stages of the student's education in this or any other craft as put into effect in the Lahore School of Art. A system of stipends has been designed whereby any State, District Board, Municipality or Community is enabled to nominate the son of any deserving artisan and send him to work in the Art School on a subsistence allowance. To assist him to live comfortably on this, a Boarding House has been established near the school conducted on the most approved lines. By these means lads are sent in from all parts and are able to take up any course of study in the school under the most favourable conditions. In this way the deserving and persevering receive encouragement and every corner of the country comes within the sphere of influence of the School of Art.

Another step has also been taken in the direction of the improvement of the industrial arts of the Punjab which it is trusted may have a far-reaching effect on their æsthetic aspect. Up to the present the idea has only been carried out in connection with the industry of wood carving and joinery but it is quite possible with time and money to extend it to other arts. It consists of a system of art pattern books containing a representative selection of purely indigenous examples gathered from some of the most historic sources in the Punjab. One hundred different

plates have been drawn, fully illustrating all the principal styles of work in this particular material. It is proposed to reproduce these in a fairly inexpensive manner for the assistance and guidance of the wood carver. The patterns are prepared in the form of 'working drawings' and it is anticipated will be of value to any workman requiring a good series of specimens to refer to in connection with any art woodwork he may have in hand. The object of this pattern book is to prevent the rapidly increasing use of the very worst form of foreign drawing of illustration to which unfortunately the wood-carver owes many of his present-day inspirations. Not only in the trade referred to, however, is this particular failing noticeable but also in many other traditional art crafts of India is this pernicious influence being absorbed in a similar manner. Silver workers may be seen utilising common designs from cheap trade catalogues irrespective of the fact that the original article from which the drawing was copied was cast iron or earthenware, while kinkhob weavers may be seen weaving in threads of silk and gold common kitchen wall papers bearing the price of two-pence half-penny the square yard. The Industrial Art Pattern Books are an attempt to stem this tide of ugly and unsuitable designs which are now flooding the workshop of India. It must not be supposed that this scheme is for the purpose of encouraging 'inbreeding,' by binding the workman down to the sole use of indigenous and traditional patterns. No objection could be raised to artistic elements from any source being introduced into Indian manufactures, art must grow and progress as do all things. But it has been initiated with the purpose of guiding the workman into the right lines and of preventing him from being contaminated by unsuitable and inartistic ideas in his efforts to produce novel results.

Of the other art trades of the province, the industry of metal embossing may be specially referred to. This is mainly carried on in Amritsar and is principally in the hands of Sikh workmen. It was probably developed very

extensively during the reign of the Maharajah Ranjit Singh as much work of this type is to be seen on the Sikh temples of that period. The style is usually architectural in character, due to its employment on buildings for doors and other similar features, but there is very little demand for this now. It has therefore been utilized for the decoration of smaller articles such as bowls, vases, lamps, etc., and a certain market is found for these in both copper and brass. To stimulate the art a class has been instituted in the School of Art, Lahore, for all the various forms of hammered metal work, and one or two fully qualified students have passed out and opened shops in the bazaar. As in the wood-carving section this branch is under the direction of two of the best metal workers procurable in Amritsar and this arrangement of the tuition has been found satisfactory. A course of study has been designed based on the methods evolved in the bazaar by which the experienced workman teaches his son or apprentice. This system is a modification of and an improvement on the somewhat crude indigenous curriculum and the results are proportionally better in many ways. It may be mentioned that a similar course has been adopted with regard to the methods of teaching the other art industries in the school. A carefully graded series of examples and designs has been prepared, after a very close study of the art as carried on by the craftsmen of the Province, and, guided by the principles underlying the indigenous process, this is the foundation of the teaching as conducted in the school.

Many other artistic trades characteristic of the Punjab might be described, as for example, the ivory carving of Delhi or the damascening of Kotli, besides a host of smaller industries carried on by one man here or a family there, all of which have some special artistic interest. The foregoing may, however, convey an idea of the more important art industries of the Punjab and call attention to a few of the steps out of many that have been taken to develop and encourage these on approved lines.

HOME INDUSTRIES FOR INDIAN WOMEN.

BY DR. M. C. NUNJUNDA RAO, F.C.S.,
Assistant Chemical Analyser to Government, Madras.

The radical reforms in the administration of India which the Secretary of State's despatch foreshadows and the inauguration of which is looked forward to with sincere gratitude by the teeming millions of India, promises to allay, in a great measure, the ferment into which the country has been recently thrown. I venture to hope, and may God grant it, that we shall have some leisure before another upheaval takes place, which God forbid, to take stock of our material condition, to devise measures for improving it, and to actually carry out a worthy programme of industrial regeneration, without the attainment of which we can never hope to rise not merely to the full measure of the requirements of the existing commercial competition, but of the very struggle for existence.

The administrative reforms adverted to above directly concern and probably interest only the educated and well-to-do section of the community. They will not directly help to lighten the burdens of the poor, nor even to give the famished population one additional meal in the week. Those of you, gentlemen, who have had access to the blue books on India need scarcely be told that half the population of India live on starvation diet and that an unconscionably large number die annually from absolute want of food. India to-day is undoubtedly the poorest country in the world, especially in the sense that the normal condition of the population is one of chronic and abject poverty. In her resources, she is certainly rich. The mineral wealth of India is almost unlimited. She supplies raw material for almost every conceivable industry. The intelligence of her people is of the very highest order. They are the most industrious and thrifty people on the face of the globe, and yet she is to-day, the poorest country in the world. Many are the causes which have conspired to bring this paradox

into being, some of them external and beyond our control, but many, of our own making. It is hardly profitable to inquire into them just now. Our duty lies in the direction of doing our level best to improve the condition of our brethren, particularly the masses ; and in the light of the past experience of the civilized world, this cannot be achieved by concentrating our attention on agriculture alone. The affluence of the Indians, in days long gone by, was as much the result of Mother Earth's bounty as of the handicrafts of her sons. The inevitable conclusion therefore is, that we must revive our industries, if we desire to work out our salvation.

I use the word 'revive' not perhaps very advisedly because, working on the old lines, it will be impossible to oppose the overwhelming flood of manufactured goods which Western countries, and Japan within recent years, are pouring into India. With the help of steam and electricity on the one hand and capital, enterprise, co-operation and skill on the other, production has been cheapened to an extent which makes it possible, even with freight on transport, to offer the finished article at prices with which it will be ruinous for the real hand-made product to compete. The establishment of large industries on modern commercial lines is therefore imperatively called for, not only to increase the wealth of the country and to find employment for a considerable portion of the starving millions of India, but also to cheapen production in order to enable us to compete with the machine-made products of foreign countries and to increase the output so as to adequately meet the demand. But the opening of large industries is bound to bring in its train the factory system with its attendant evils, evils too well known to require repetition, but we have to put up with them if we are to enter the lists of industrial and commercial competition. There is, however, a great issue involved in the recommendation to open large industries, which I raise not without much hesitation and great diffidence. From the standpoint of

and the idea of greatly improving the condition of the labourers of India merely by adding to mills and factories is only possible for those who form their opinions 6,000 miles away. No, gentlemen, any comprehensive plan of improving the condition of our industrial classes must seek to help the dwellers in cottages. It is the humble weavers in towns and villages, the poor braziers and coppersmiths working in their sheds, the resourceless potters and ironsmiths and carpenters who follow their ancestral vocations in their ancestral homes who form the main portion of the industrial population and who demand our sympathy and help. It is they (more than the agriculturist or the mill and factory labourers) that are most impoverished in these days and are first victims to famines, and if your Swadeshi movement has brought some relief to these obscure unnoticed millions and tens of millions in India, as I have reason to believe it has done to a perceptible extent, if it has created a larger demand for their manufactures, widened the sphere of their labours and brought some light to their dark and cheerless homes, then the movement, gentlemen, has my cordial sympathy. Help and encourage the large industries, but foster and help also the humbler industries in which tens of millions of artisans are engaged, and the people of India as well as those who are engaged in the work of administration will bless your work.'

Besides the cottage worker, there is an enormous quantity of hand labour which is now allowed to run to waste in our homes, and my chief purpose is to impress its importance on the economic well-being of the community. Home industries in this country, I beg to assure you, gentlemen, are pregnant with great possibilities. I understand that over one thousand families in Japan employ their leisure hours in the production of hosiery and supply not only the local demand but export them to foreign countries. In one of his addresses H. H. the Gaekwar refers to home industries and states :—

'Among other means of improvement the education of women in decorative art would bring a fresh economic force into play; and as I ascertained by inquiries in London, made from a desire to find lucrative home industries for our women, and especially for widows, it would prove extremely profitable if the right steps were taken. Tapestry, for instance, is a great women's industry in Switzerland; lace work, cretonne and embroidered cushions could all very well be done by women. Needle work is even now done in Guzerat homes. If the designs and colouring are improved it might be turned into an active industry supplying our own wants and possibly outside demands. Carpet weaving also, which is now done in several of our jails, might in the same way be turned into a profitable home industry. The main thing is to study the market and not to pursue our own hobbies. It would be necessary to have agents in Europe who would study European

wants, consult professional men and get designs which could be executed in India. My inquiries in Paris convinced me that in the hands of capable persons their method would be both practicable and profitable.'

The many suitable home industries in which our women might profitably be engaged I shall refer to later on, but to the great good it will bring to those engaged in them Mr. Hadaway of the Madras School of Arts bears testimony in a private communication to me. He writes :

' I know of so many interesting instances of the revival of home industries in Europe, cases in which whole communities have been raised from abject poverty to something approaching affluence, and I am personally so much in favour of hand work over machine work that you can understand how absorbing the subject has been to me. Also in a smaller way, I have been for many years in contact with individual handicraftsmen and women and then again have seen many great improvements in peoples' condition brought about by their own efforts.'

It may be news to many that Surati women whatever their status in life, engage in making caps the popularity of which has not in the least suffered even by the introduction of European felt caps. Komatti women, most of them rich, do not scorn to turn even a penny out of their spare hours by stitching eating leaves. Palmyra leaf basket-making is an occupation and a source of income to the womenfolk of the wealthy Nattukottai Chetties. The Lubbay women spend their leisure hours weaving grass mats and Mahomedan ladies weave *lametta* lace and do embroidery work from the proceeds of which they contrive to supplement their husbands' incomes.

Among the numerous trades which may be successfully and profitably introduced as home industries may be included the knitting of socks, neck-ties, woollen caps, and small baniyans by means of small and cheap knitting machines, crochet work, sewing, needle work, including embroidery braid, tape and lamp wick making, palm leaf weaving, making of window chicks with stencil painting, cane and reed work, beads, curtains, etc.

Speaking from personal experience I may state that machine knitting and embroidery work pay a decent return,

To give you some figures, my girls have been making ornamental neck-ties of mercerized cotton and cotton and woollen socks and finding a ready sale for them in the local markets.

The cost of cotton yarn required for making a dozen neck-ties is Rs. 2, and a girl working only in the afternoon can easily make a dozen of these with the help of a simple and cheap knitting machine costing about Rs. 120. It has been possible to sell these at Rs. 3 per dozen giving a profit of a rupee for an afternoon's work. The ordinary retail price of these varies from 6 as. to 8 as. each.

Sock-making is not just at present quite as paying as the neck-ties, because proper yarn for making socks cannot be had from Indian mills. English cotton yarn is more costly. The cost of cotton yarn required for making a dozen pairs of socks comes to nearly Rs. 2, and a girl can only turn out at the utmost about six-pairs in an afternoon and these are sold at Rs. 3-8. per dozen pairs, giving thus a profit of only 12 as. for the afternoon's work ; but the demand for socks being more steady than for ties, it more than makes up for the difference in profit. The socks turned out by the hand power machines, it may be noted, are much better in quality and last longer than those made by power-driven machines and sell readily as the consumer usually prefers them to the latter.

Within my personal knowledge is the case of a Brahman clerk who struggled hard at one time to make both ends meet, but his wife taking to home industry in the line of embroidery work they now live in comfort. She makes embroidered table cloths and teapoy covers and finds a sale for them easily. The raw material required costs about a rupee and a half and the labour of a boy engaged at 3 as. a day, for three days, *i.e.*, in addition another nine annas. The finished article sells at from Rs. 5 to Rs. 6 and thus she is able to make a profit of Rs. 3 to 4 in three days, the time required for making a table cover with

the help of a boy. This added to the husband's salary has placed them not only above want but in absolute comfort.

An excellent avocation for Brahman women would be the making of preserved fruits and pickles which every one can buy and use without caste scruples. Mangoes and various other acid fruits and berries which in villages could be had for the gathering but which unfortunately are neglected and allowed to rot and waste, afford the material for carrying on the business with the smallest possible outlay.

One other important industry to which I beg to invite your special attention and in which no fewer than 3,000 families in a single town in Persia, that home of carpets, are employed is that of carpet weaving. This is one of the artistic industries which in the words of Alexander Nulard, not only serve to give a living to those engaged in them, but are to many of those a source of constant pleasure. When seen in practical operation, its processes never fail to arouse the lively interest of the average man, and a statement of its possibilities as a field for design and colour is always interesting to the decorative artist.

Carpet weaving in India however is now in the hands of the lower strata of society—of illiterate and ignorant men mostly Mahomedan and of convicts in various jails. Besides, it may not prove as commercially successful as some of the other industries. I have tried it in my own house and found that while our girls learn it with great ease and like it immensely, it is not as paying as the making of socks or neck-ties or embroidered articles from the point of view of rupees, annas and pies.

I should however strongly recommend it to those to whom the profit of their labour in money is not a consideration. It must be taken up as a work of art and 'not as manufacturer's piece goods produced at competition prices' as Sir George Birdwood puts it. In the hands of the refined and intelligent girl or woman, the arrangement of colour and variations in the design of carpets are sure to

improve and invest them with an artistic beauty which I am sorry to say is very remarkably, if not altogether, absent in those turned out by the present illiterate workers whose sole aim is pecuniary profit.

Some of the carpets made by our girls were exhibited at the Madras Fine Arts Exhibition and at the Mysore Dassehra Industrial Exhibition and were very much appreciated by the Judges. They were awarded bronze and silver medals. Dr. Thurston, writing about them soon after the Fine Arts Exhibition, said that many European gentlemen and ladies appreciated the carpets made by these girls.

After all, the great problem that besets the path of the home worker is how to find a ready market for his output. This is a difficulty which undoubtedly exists at present, but which it is within the power of our philanthropic capitalists and commercial men to solve. The points to be kept in view are (1) that the finished product should not be allowed to lie on the hands of the producer, (2) that they should be bought at a fair price consistent with its market price, (3) that no advantage should be allowed to be taken of his need to dispose of the goods at once, (4) that he should be able to purchase raw material in retail at almost wholesale prices, and (5) that in the ultimate net profit which the sale of his goods brings after deducting interest on capital he should be allowed a fair percentage. In a paper on Home Industries prepared by me to be read at the lecture meetings held in connection with the last Mysore Industrial and Agricultural Exhibition, I made the following suggestion, which with your leave I beg to reproduce.—

‘It strikes me that if we can organize Co-operative Societies in different centres and villages somewhat on the lines of the Danish Co-operative system, which is “a combination of a number of proprietors for sending their products to a central factory in which each of them has a share proportioned to the quantity of his contributions” the difficulty can be overcome. The village society should supply the necessary raw material at wholesale prices and buy the finished article from the producer and send it forward to a central Institution, to which the village societies will be

affiliated, to arrange for their sale. The Central Society will have to be chiefly financed by our capitalists, but village and urban societies, of which the actual producers are shareholders according to the quantity of their contributions, will also contribute. In their management each member should have an absolutely equal voice irrespective of the extent of his share interest. The net profits will be divided in proportion to share interest which each has, whether individuals or societies. The advantage of such a system is that whereas the working man or woman is able to obtain the raw material at about wholesale prices and dispose of at once the finished product at a fair price, he or she will further participate in the division of profit at the end of the year. This will put an end to the prevailing feud between labour and capital. I must confess that the above is submitted merely as a suggestion to be altered, modified and improved upon by wiser heads.'

The next point to which I beg to refer briefly is the education of our girls, if home industry is to become a success. The observant Gaekwar of Baroda laid down in one of his addresses, from which by the way it is impossible for me to resist the temptation to quote, that 'the training of the eye and of the hand at an early stage is useful to all, even to those who have not to support themselves by manual industry in life.'

And His Highness added that 'to attach some industrial classes to our ordinary schools would have the healthy effect of giving a complete and not one-sided education to our children. The richer classes would be brought more in touch with humble industries; the poorer classes would acquire that skill and facility in handling tools which can be only acquired at an early stage; all people in all branches would be impressed with the dignity of manual labour more than they do now in India and the great endeavour to promote the industries of the land would be greatly helped when the nation receives an elementary technical training in schools.'

I think it extremely important that drawing and clay modelling should be systematically and compulsorily taught in our schools and one hour a day devoted to manual training both in boys' and girls' schools. Boole's system by which the creative faculties of very young children are said to be almost unconsciously developed without putting any strain upon their brains or nervous system may be introduced in some of our schools. Mr. Havell in one of his letters to a friend writes as follows about this system and I make no apology for quoting in full what he says :—

'There is another question—and a very important one—the training up of the artistic faculties and the development of hand and eye from the earliest age so as to get the best out of your young women and men. There is a very excellent system lately introduced into some of the most progressive schools in England by which the creative faculties of very young children (beginning at 5 or 6 years) are almost unconsciously developed without putting any strain upon their brains or nervous system, and I am told that it produces wonderful results. It is invented by Mrs. Boole (who discovered what is known by mathematicians as 'Boole's Law') and I can recommend it to you the more as she tells me that it is based upon principles of Indian scientific methods which her husband studied very deeply. The book which will tell you all is by one of Mrs. Boole's daughters, Mrs. Somerville, and it is called 'A rhythmic approach to Mathematics.' Together with the book there is a set of cards called 'Boole's Sewing Cards,' to be worked with a needle and different coloured threads. The publishers of the book and of the cards are Philip & Co. You can order them through any bookseller. The book is I think 3s. 6d. and the box containing a full set of cards, thread, needles, etc., 5s. You need only order one box as a pattern, because once you know the principle of the work it will be easy to get everything in India at a much cheaper rate. The idea is that children and young women trained up in this system, have their active thinking powers developed at the same time as their fingers are trained, so that not only do they find complicated mathematical problems much easier than is generally the case, but their inventive powers and skill of hand are highly developed at the same time.

'I think you will realise how important this is for India, for it is just the inventive faculties and skill of hand which our present system of education has hitherto completely ignored, and it is mainly on this account that India has lost its position in the industrial world. I know that some of the best educationalists here think very highly of Mrs. Boole's methods and you could not do better than introduce them into your own home and induce all your friends to do the same.'

Gentlemen, in India, it has to be recognized that social conditions, especially the caste system, stand in the way of the easy adoption of home industries. For centuries past, manual labour has been looked down upon and assigned by the intellectual and influential Brahman and the well-to-do non-Brahman classes to the Sudra caste. It will therefore take long before we are able to induce our ladies to believe in the dignity of honest labour. Example more than preaching and precept will, I venture to hope, facilitate matters and it seems to me to be a duty devolving on the upper ten to set the example in this instance.

It is true they have no need to work in their own pecuniary interest, but in view of their educative influence on the proud but indigent portion of the community, they ought not to hesitate to move in the matter.

THE CENTRAL PROVINCES AND BERAR EXHIBITION OF 1908.

By C. E. Low, Esq., I.C.S.,

Officer on special duty, and Secretary of the Exhibition, Nagpur

The idea of holding an exhibition at Nagpur was originally mooted by the local Congress Committee in the rains of 1907. They then approached the Chief Commissioner with a request that Government might see their way to assist them by a financial grant and by directing the Agricultural and other Departments of Government to take part in the Exhibition. This request however was made at, what was in Mr. Craddock's opinion, too late a date for the successful organization of such an undertaking, and he therefore strongly recommended them to postpone the idea till next year when he assured them that unstinted assistance from the Government would be forthcoming. The local Congress Committee accepted the suggestion ; in view of the causes which prevented the holding of the Congress at Nagpur last year it was fortunate that they did so. Early in December, however, a further move was made : a meeting of influential and representative citizens of Nagpur with a number of gentlemen from all parts of the Provinces including among them such well-known names as the Hon'ble Mr. G. M. Chitnavis, Sir B. K. Bose, Rao Bahadur R. N. Mudholkar and others was held, at which it was resolved to approach the Government with a request that the offer of assistance already put forward might be made good, and as an earnest of popular support a sum of upwards of Rs. 7,000 was subscribed on the spot, and it was resolved by the meeting that there would be no difficulty in raising a public subscription to the extent of not less than

Rs. 25,000 which Mr. Craddock had stated as the minimum sum in his opinion necessary. The resolutions of the meeting were placed before Mr. Craddock who expressed his willingness to make a Government grant of half a lakh of rupees and to allow a further contribution from local bodies of Rs. 25,000. He also placed my services at the disposal of the Committee to assist in organising the Exhibition. The Committee had, in anticipation of Mr. Craddock's acceptance of their proposals, appointed a General Purposes Committee with whom the real responsibility of directing the organization of the Exhibition lay throughout.

It is characteristic of the change which has come over India since the last time an exhibition was held at Nagpur 43 years ago that on the former occasion only two non-officials figured on the list, all the rest being officials, while on the present occasion the positions were exactly reversed. As this committee was to be a Working Committee, meeting at frequent intervals, its membership was necessarily confined almost entirely to residents of Nagpur, but it was felt that the Committee could not entirely deprive themselves of the services of such gentlemen as Messrs. Mudholkar and Kelkar, though residing at some distance from Nagpur. This Committee held its first meeting almost at once and proceeded to appoint a series of sub-committees to deal with the various sections under which the exhibits would fall, as well as with certain other subjects such as accommodation, advertisement, sanitation, etc., which pertain to the general organization. Two Joint Secretaries, Rao Bahadur V. R. Pandit and Mr. Krishna Rao Phatak, had already been selected to share the secretarial duties with myself; and on the three of us lay the responsibility for keeping the Committees at work, managing the office, putting up proposals on points that required decision by the various Committees and generally keeping things going between the committee meetings. All detailed proposals regarding the various sections or subjects were either initi-

ated by or fully discussed in the various sub-committees, but the main responsibility for the general lines adopted and the power of sanctioning lump sums within which the sub-committees were allowed to make their own arrangements lay throughout with the General Purposes Committee.

The first and most important step to be taken was to awaken the interest of the outlying districts to what was being done and to organise their efforts. My official appointment at this time was that of officer in charge of industrial surveys and I was engaged in organising district committees to assist me in this task by providing information regarding the condition of local industries. These committees were made use of also as District Exhibition Committees. They were responsible for making known the proposal to hold an exhibition, for eliciting public support and subscriptions and for collecting typical and interesting exhibits. The part of their work which was most urgently necessary at the time was that of collecting subscriptions—a task which had to be pursued with care and discretion in view of the serious loss of crops which had overtaken many districts of the Provinces. For this reason very little official assistance was given in the collection of subscriptions. A total of Rs. 1,01,000 was readily reached, which proved amply sufficient for all requirements, with the contributions from the Government and the local bodies. Had the season proved more favourable, and had it been necessary, a far larger sum would have been forthcoming. It was not expected at first that the total funds available would greatly exceed Rs. 1,25,000 and the initial preparations for the Exhibition were on a smaller scale. As it gradually became apparent how large a measure of support was forthcoming both from our own Provinces and from exhibitors in other parts of India, the scope of the scheme was greatly extended. The sub-committees set to work in real earnest in working out the details for which they were severally responsible, and frequent meetings of the General Purposes Committee were necessary to dispose of the

various proposals put up by them. A prospectus with an introduction containing an account of the origin and purpose of the Exhibition, followed by rules, forms, etc., was put in hand, and edition after edition of it was widely circulated to all parts of India. I visited Calcutta and Bombay on various occasions to elicit the support of the larger firms and of the Chambers of Commerce and similar public bodies and to conduct negotiations with the Railways regarding the extent and nature of the concessions to be granted by them for visitors and exhibits. I found however much difficulty in reaching the class which we most looked to for support and whom we were most desirous of attracting, namely, that of the small Indian manufacturers, and we eventually found that the only way of doing this was by appointing canvassers. The success of canvassing however is uncertain in the absence of immediate supervision, and its results differed widely; very successful canvassing was done by Mr. Joshi, a retired Deputy Collector of the United Provinces, and next to him Mr. S. C. Biswas in Calcutta did most for us. It is impossible to canvass for exhibits by any other agents than through salaried canvassers, and it is only by a very careful selection of these that any satisfactory results can be hoped for.

Negotiations for the loan of machinery, for lighting and power and the arranging of such matters as insurances on special rates, railway station facilities, assistance from the Public Works and other Departments of Government were mostly in my hands, but the work of the sub-committees went on throughout and a detailed description of the more important of these will show better than any other method what the organization of an exhibition really means. Taking first the work of one of these section sub-committees, that of the Textile Section, we had to discover first of all exactly into what classifications we proposed to divide the exhibits when they came; for this the advice of commercial firms and the gentlemen connected with the hand-weaving trade was, fortunately for us, freely available,

The sub-committee had also carefully to consider what types of machinery it was desirable to exhibit and in what way the section could be made most effectually to benefit the mill-owning as well as the artisan interests in the Provinces. The general policy laid down here as in other sections was to show the Central Provinces what the rest of the world could do for them and to show the outside world what prospects the Central Provinces could offer to investors. With this end in view, no effort was made to invite the display of foreign-manufactured articles other than machinery, and no inducements were held out to the producers of such articles to compete.

For the benefit of the artisan a competition among improved types of handlooms was arranged for and district committees were authorised to organise visits by parties of weavers from the most important weaving centres to view the competition. The various districts of the Provinces were specially requested to display the best types of textile goods produced by their handloom weavers and the mill-owners of the province were also asked to make this an occasion for a special display of their characteristic products. English manufacturers of mill machinery were asked to show certain improved types of looms and spinning frames, but not much response was received to this request; on the other hand some excellent exhibits of cotton gin manufactured in the country were received from Messrs. Wadia & Co. of Ahmedabad. After the receipt of replies to their appeals the sub-committee had to consider the probable amount of space which the exhibits would require for their proper display. But it will be readily understood that the building operations could not wait for receipt of this information. A general scheme had to be laid out by the Building Sub-Committee and submitted for the approval of the General Purposes Committee, which was capable of easy adjustment to the roughly estimated requirements of the various sections, which would not be too costly and which would fit in with the site selected. The co-ordination of

the scheme as it was worked out by the Building Sub-Committee with the estimated requirements of the various sub-sections required very careful watching and the success of an exhibition, it may be said, depends very largely on whether this co-ordination is duly effected or not.

It was impossible for the sub-committee to foretell except by the merest estimate, the amount of exhibits that were likely to be forthcoming ; not even when the application forms began to come in, which was as late as September, could any real idea of the space likely to be filled be obtained, and the anxiety of the sub-committee did not cease until the great bulk of the exhibits had duly come to hand and been placed in position.

I return now to the work of the Building Committee. This Committee consisted of two or three contractors and other private gentlemen of position in Nagpur with special knowledge of local building facilities and several members of the Public Works Department. This was the only sub-committee on which the official element was very strongly represented and it was in deference to the strongly expressed wishes of the General Purposes Committee and other members of the organising body that the services of a Government Engineer were asked for to take charge of the work. It was to the unremitting efforts of this gentleman, Mr. Jhandamul Ghay, an Assistant Engineer trained at Dehra Dun, that the work was punctually and satisfactorily completed, a fact which added very largely to the success of this Exhibition. Another very important body was the Accommodation Sub-Committee. These gentlemen had to estimate, no easy task, the probable number of visitors, and to consider how this might be efficiently and comfortably provided for with as little expense as possible. It was recognised from the beginning that Nagpur, unlike Calcutta or Bombay, could not of itself furnish one tithe of the visitors required to make such an exhibition as it was proposed to hold anything like a success, and the efforts of the district committees to send in visitors had

to be fully reciprocated by the preparations made in Nagpur to receive them when they came. Two camps, holding respectively 1,600 and 1,000 persons, were prepared for the poorest class of visitors, hotel accommodation for between one hundred and two hundred Hindus, about forty Europeans and Parsees and about the same number of Mahomedans was provided and hotel contractors induced to take over the management. Camps for 25 Feudatory Chiefs and Zemindars or other gentlemen of position were constructed in a convenient locality. All these as well as the Exhibition required careful sanitation and had to be provided with a proper water supply, which task fell to the lot of the Sanitation Committee to accomplish. The Exhibition had to be kept before the public both within the Provinces and outside them. This was the work of the Printing and Advertisement Sub-Committee. Audit had to be arranged for, and though the rules regulating expenditure had necessarily to be as elastic as possible, the reason for careful scrutiny of accounts by professional accountants was not therefore the less but the greater. To Rao Bahadur V. R. Pundit fell the work of regulating the financial affairs of the Committee—a most laborious task, and one that he performed with the greatest care and faithfulness. It was necessary to keep constantly before the General Purposes Committee the figures of receipt and expenditure and to this purpose the device of a draft or fluctuating budget which was altered at frequent intervals was adopted.

Care was taken to keep the district committees fully informed of the progress of the Central Committee's work and a monthly report in narrative form was sent to them. This served to sustain their interest in the work of organising and was of use to them in answering the questions of persons interested in the Exhibition.

It is quite impossible to run an exhibition as a one-man show, unless, it may be, when the man is a professional exhibition manager of the Imré Kiralfy type and even

then I imagine he would learn a great deal at every fresh exhibition he held ; but where all the agency employed, whether official or non-official, is practically speaking amateur and entirely lacking in experience, no single man can foresee all the probable requirements or devise the means of meeting them. It is only by the closest interchange of ideas, by constant meeting and discussion, and by the friendliest co-operation, that a general stock of knowledge can be acquired, out of which a system containing in it the germs of success, is capable of being built up. In each case of the Central Provinces and Berar Exhibition this co-operation between the members of the organising body, both official and non-official, existed, I am happy to say, to the very fullest extent. The officials depended on the non-officials for their knowledge of popular sentiment, of trade requirements and all the arrangements necessary for the convenience of the exhibitors, while they in their turn, were able to help the non-officials by pointing out to them the most convenient and business-like ways of organisation. In the fullest sense it is true to say that neither class could have succeeded without the assistance of the other. The Exhibition owes its punctuality, promptitude and system, important things enough in their way, to its official helpers, but to its non-official members it owes what is even more important ; its representative character, its picturesque arrangements and decorations and the popular interest taken in it throughout the Provinces.

With this brief sketch of the preliminary arrangements, I pass on to a description of the Exhibition itself.

The Exhibition was located on a long strip of ground lying at the foot of Fort Sitabuldi and on the triangular patch of ground partially occupied by the old arsenal. It was at one time hoped that it would be possible entirely to remove the arsenal in time for the construction of the Exhibition buildings, but the Military Department do not seem to count celerity of action among their numerous virtues

and it was therefore necessary for us to make the best disposition of the ground as we found it. This accounts for the long narrow shape of the Exhibition site. In laying out a site for an exhibition the first thing is to decide what the central idea is to be ; we considered that a main roadway passing through one or more courts and broken up by occasional small buildings was best suited to the lie of the ground and to the purpose of the plan. With this idea to start upon, we then proceeded to work out the details. Various types of buildings were chosen, an open type being selected to contain the bulk of the exhibits, as it is capable of more ornamental treatment than the closed type which appeared to be the prevailing style in Bombay. With careful watering of the ground to prevent dust, efficient guarding and a thorough cleaning of the exhibits every morning we found no further precaution needed. The more valuable exhibits of course were contained in closed buildings constructed of brick in mud with wooden uprights and red-tiled roofs. The main gateway was constructed of 9" teak poles well braced together, overlaid with bamboo wattle work, covered with cloth and painted in burnt umber on a white ground. This was the cheapest form of construction possible consistent with decent appearance and it was universally admired. The most successful among the plans of ornamentation adopted was the series of paintings occupying the spandrels of the arches, several hundreds in numbers, which fronted the open type of buildings. These were all free-hand designs by native *chitaris*, taken from the Ramayana and Mahabharata and other sacred books and in certain cases imaginative designs suited to the classes of exhibits which the building was intended to contain.

The Exhibition Committee were fortunate in attracting the liberality of the wealthy banker, Dewan Bahadur Kasturchand Daga who presented them with a sum of Rs. 25,000, to be expended on a permanent building which would serve as a memorial of the Exhibition in future years

and as a permanent decoration for the Public Park which it is intended to lay out on the site now occupied by the Exhibition. This building, which is of purely oriental type, is constructed of local sand-stone. The foundation-stone was laid on the 22nd May, and the whole building was completed within five months, in spite of the difficulties of a very heavy monsoon. It was decorated at night with chains of electric lamps, and attracted the admiration of all visitors.

Turning now to a description of the various sections, there is no doubt but that the greatest success has been achieved by the Agricultural Department. It is only proper in a province so largely dependent on its agriculture as the Central Provinces and Berar, that the Agricultural Section should take a really prominent position. Out of the 72,000 feet of covered space in the Exhibition, this section occupied no less than 16,000 besides an open space of nearly 6 acres : there was an open field of about 2 acres in extent in which machinery was shown in motion, as well as improved methods of rice cultivation as practised on the Government Farm at Raipur. The exhibits which attracted the most attention are the Cawnpore Chain Pumps of which 60 were sold on the first two days of the Exhibition, the sugar-making plant of Mr. Chatterji of Khandwa and of Khan Bahadur S. M. Hadi of the United Provinces Agricultural Department. The Bengal Agricultural Department sent down a very fine lot of exhibits, especially the mulberry silk and tasar manufacturing plants. From the local Department a series of crop exhibits were put in to show all the varieties of the leading Central Provinces crops, the most interesting being those under the head of cotton, which showed the best type of cotton originally grown in the Central Provinces and Berar and illustrating its deterioration under the impulse of a desire for a larger yield of a lower and inferior staple. There were numerous demonstrators at work in each portion of this section, constantly explaining to the visitors the use and the meaning of the various exhibits.

and several of them were always surrounded by a crowd of eager and interested listeners. It was the general opinion of visitors, that never had an agricultural exhibition been so efficiently conducted in India or on so extensive a scale, and with the prospect of so much real benefit to visitors. There were several large exhibits put in by importers and manufacturers of machinery. Messrs. Burn & Co. displayed a number of machines mostly of an agricultural type, and Messrs. Marshall & Sons and Greaves Cotton showed a number of oil and steam engines, disintegrators, pumps, machine tools and other exhibits likely to be of use in furthering the manufactures of the country. The latter firm had also a set of Hattersley weaving, warping and sizing apparatus on view. This represents the most efficient and expensive form of hand weaving machinery, but it has yet to be proved that it can be successfully worked otherwise than under factory conditions in this country.

The largest section next to the Agricultural was the Miscellaneous Section. This contained everything that did not fall under the head of wood and metal, machinery or textile articles. Apart from the patent medicines and articles of food such as chutnies, condiments, jams, pickles, &c., which connote no great amount of manufacturing skill or enterprise, the most important exhibits were numerous displays of small Indian manufactures, such as buttons, brushes, combs, matches, and other industries which have sprung up during the last four or five years. The pluck and enterprise which the apparent success of these industries showed, struck every one very forcibly. From every part of the country, from Gujarat, from Madras, from the Punjab and even to some extent from Bengal, exhibits of this sort were forthcoming in considerable numbers, and there is good reason to hope that the success of these smaller industries, which seems very hopeful, may shortly lead capitalists to make somewhat wider ventures in directions which are likely to lead them to even greater financial success. There was an interesting collection of

paintings and photographs displayed, though of very unequal merit. There were numerous imitations, some very successful, of Western art, but besides these there were a few paintings which seemed to me rightly or wrongly to possess a germ of what might come to be the Indian art of the future. Without departing from the subjects and methods so intimately connected with the history and religious ideas of the Indian people, the painter had succeeded in improving the colouring and drawing and general technique to an extent which rendered the general effect far from unpleasant. It is even more difficult for a painter to succeed in the methods of a foreign nation than it is for a poet or speaker to be imaginative or eloquent in a foreign language. When it is done it is generally ill done, and even when well done, it served no useful purpose. The highest efforts of imaginative genius are impossible except when based on subjects and executed by methods which are intimately akin to the nature and feelings of the artist and the surroundings among which he has been brought up. I allude more particularly to the mythological paintings of the Balasaheb of Aundh who is, I understand, a follower of the school of Ravi Varma. The same building contained a very valuable collection of jewellery lent by the chiefs and nobles of the Central Provinces aggregating in value about Rs. 7½ lakhs. Jewellery always attracts the public rather in proportion to its value than to its intrinsic and artistic merit and the present case was no exception. A very noteworthy exhibit in the Miscellaneous Section was that put in by the Bengal Chemical and Pharmaceutical Works who displayed a very well made lot of scientific apparatus and have, I understood, at once secured some orders from the local laboratories, including the laboratory of the Technical Institute.

The Textile Section contained among other most valuable exhibits sets of beautiful gold brocaded cloth from Barhanpur, Poona and Benares. I must confess that the Barhanpur exhibits were, in my opinion by far, the most

artistic, but that may be owing to my provincial patriotism rather than to my judgment. It seems, however, unfortunate that these beautiful fabrics still command very few purchasers. The wealthy nowadays prefer to spend their money on ingenious toys from the West rather than on the truly beautiful manufactures of their own country.

The Ladies' Section was entirely managed by a committee of ladies of whom Mrs. Roe was Secretary. This section was most successful in the collection of exhibits, although they came in such numbers that room was found somewhat insufficient at last. In particular, the collection of dolls was greatly admired, although the prices were too high for most visitors.

The Loan collection found contributors from all over India and from England, Lady Minto and Princess Augusta of Schleswing-Holstein being the best known.

A Purdah gallery was placed in the Ladies' Section from which strict purdah ladies were able to see over a great part of the Exhibition, while unseen themselves.

The Himalayan Industries Company with a great variety of articles, illustrative of the very artistic industries of Kashmir, occupied a prominent place in this building and sold a great many goods. The remaining buildings were occupied partly by the machinery and partly by the textile products of the Provinces and other parts of India. Among provincial exhibits the stamped *jajams* of Nagpur and Chanda possess, perhaps, the most *artistic* merit but there were many beautiful and interesting articles produced by the handlooms of Umrer, Chanda, Bhandara, Nagpur, Burhanpur and other parts of the Provinces, and the Committee who were at work selecting patterns for the new pattern books found a wide field for selection. The Textile Appliances Shed contained several interesting machines, especially the tape-weaving machines invented and constructed by Mr. Akbarali of Ludhiana. At the back of this range of sheds was the long building

devoted to the handloom competition, which contained about twenty different kinds of improved looms. This competition was held on somewhat novel lines. In order to eliminate the differences caused by different methods of warping and sizing, sized warps, either beamed or hanked, were provided by the Exhibition Committee for competitors, an opportunity being given beforehand to the competitors of trying specimen warps. Sizing and warping are no doubt of extreme importance, but trials of these operations should be made separately and should not be allowed to obscure the merits of any particular loom. Parties of weavers were brought in from the most important centres to see the weaving operations and it is in contemplation to decide on one or more centres where weaving schools should be started under the Department of Agriculture at as early a date as possible. The Exhibition and the Handloom Competition cannot fail to awaken the interest of the weaving class in this most important question, and it largely depends on the attitude of the men visiting the Exhibition, as to where the attempt of introducing the improved Handloom will be made.

The Wood and Metal Section contained mainly artistic exhibits, except in the Overflow Section, which it proved necessary to provide and which was situated to the south of the Agricultural Section. In the main Wood and Metal Section, the most important building contained silverware both on loan and for sale; the most admired were the product of the Burmese silversmiths sent over by the Burma Government. There were some beautifully illuminated manuscripts, the family books of ritual of the Bhonsla Raja, which were placed in this section in order to be kept with certain other exhibits lent from the same family. The art of producing these illuminated works, once well known in Nagpur, has entirely died away, which is a matter for great regret. The colours were as brilliant as on the day they were painted and they compared in beauty or interest with the most splendid

productions of the Western monasteries of the Middle Ages. The Nagpur carved wood-work astonished many residents of Nagpur itself who were surprised that anything so beautiful could be produced so close to their own doors. Some of the exhibits of brassware were interesting from their quaint shape and curious designs, others from their elegant lines and the artistic spirit shewn in their decoration. The bell-metal articles from Mandla had the advantage of a very beautiful material to work in and the designs followed were almost always pleasing to the eye. Here, too, the Patterns Committee were able to select a number of articles of artistic merit. The overflow sheds of the Wood and Metal Section contained a quantity of leather manufactures from Messrs. Sutar and Co., and other makers, also exhibits from the Indian Aluminium Co. of Madras. They seemed to find a number of purchasers and it would be an advantage to the poorer classes of the Central Provinces were they to become aware of the excellence of this metal for household purposes. The rest of the shed was occupied by a most miscellaneous series of exhibits. One of the Railway Companies showed its system of signalling, with a graphic representation of its methods of working: there were carriages and tongas from various manufacturers and a collection of models of more or less interest.

The Mining Section, which, through no fault of the member-in-charge, was not complete till some time after the others, contained in the first place, an interesting set of typical minerals found in the Central Provinces, and another set of minerals likely to be found in the Central Provinces and especially commended to the attention of prospectors, which were sent by the Geological Survey Department, Calcutta. Several of the local manganese firms sent in exhibits to compete for the prize awarded for the best collection.

The Forest Section, though necessarily relegated to a somewhat distant corner of the ground, was very well laid

out and commanded very much interest. The four sheds surrounding the central octagon contained a set of typical C.P. timbers in rough and finished states, a series illustrative of other forest products such as oils, roots, dyeing and tanning agents, and the processes adopted for their manufacture and the last of the four sheds contained a collection illustrative of the life of the wild tribes which inhabit our forests and furnish the Forest Department with most of their labour. The lawns surrounding the central pavilion were covered with a number of traps showing how these people snare their game. The central building was designed especially for the display of the trophies of the chase collected by sportsmen of the Central Provinces. The dado surrounding the base of the building consisted of polished planks of wood, each taken from one of the typical timber trees of the Provinces.

I have as yet made no mention of the important and interesting exhibits furnished by private firms which in almost all cases far excelled in point of appearance the buildings erected by the Exhibition Committee. *Facile princeps* was the firm of Messrs. Tata & Sons with a building to display the products of their three mills—notably the Empress Mill at Nagpur. These exhibits showed over how wide a range of manufactures their enterprise has now spread. There is probably scarcely a firm in England or on the Continent who produce such a large variety of articles. They cater no less for the handloom-weaver than for the well-to-do purchaser of mercerised goods and cloths spun from the threads of the very highest counts. Singer's were as usual to the fore with their pavilion, and the automatic figures with machines proved a great attraction. Messrs. Lipton and Co., and the Nestle's Swiss Milk Co. had erected attractive sheds which did a good trade. The Asiatic Petroleum Co. also erected a building of attractive appearance, and the Elgin Mills had a tent in the grounds containing a suitable selection of articles manufactured by them. It is always desirable to encourage

private exhibitors as they cause little or no expense to the Exhibition, and their efforts to attract visitors to their own stalls effectually brighten and add to the general appearance. The extent to which private exhibitors will participate in an exhibition depends entirely on the information which they receive of the lines on which the Exhibition is to be run, and it is necessary to lay this before them at as early a stage as possible in the clearest way that can be done.

Complete arrangements for dealing with fire were made by laying down a line of four-inch pipe connected with the main, from which various branches were taken off at suitable intervals. A steam hosed fire engine from Jubbulpore with a discipline brigade were in attendance night and day and turned out at frequent intervals to keep themselves in practice and to assure spectators that they were always to be found if wanted. The electric light and power house was one of the most prominent features of the show. Steam was generated in three boilers kindly lent by the G. I. P. and B. N. R. Companies—the latter's exhibit having been exclusively manufactured in the country by Indian labour under European direction, and it did even better than the Company claimed for it. The main engine, developing 360 H. P., was an exhibit kindly lent by Messrs. Belliss and Morcom; it drove a large Siemen's Dynamo for the general lighting and a smaller one for the cinematograph and search-light. Besides this there was a small set for night working kindly lent by the Manager of the Empress Mills. The lighting consisted of eighty-five 3000 c.p. arcs and 1500 incandescent lamps. This was provided by Messrs. Balmer and Lawrie of Calcutta and gave the greatest satisfaction throughout. As a stand by in case of failure a number of Kitson lamps was provided at the most important points. These were necessary before the electric light was got into working order and while work was going on in the Exhibition at night, and also when the electric lighting was no longer run during the breaking up of the Exhibition.

The grounds were laid out with a quantity of plants borrowed from the Maharajbag which added greatly to the pleasing appearance of the scene and the usual adornments of flags and painted cloths, etc., were provided.

The account of the Exhibition would not be complete without some description of the amusements. Some doubt has recently been cast in the course of an enquiry by the English Board of Trade, on the usefulness of exhibitions, but I do not think that at present at any rate exhibitions have ceased to be useful in a country like India, where communications are so incomplete and it is so difficult to bring home to the bulk of the people the various inventions which are likely to be of use to them. Granting the usefulness of exhibitions, we must consider that any proper means of attracting as many people as possible are justifiable. Now, there is a very large class of persons who are quite ready to give a fair measure of consideration to anything that they think will be of use or profit to themselves, but never feel interested enough to go a long distance to an exhibition, except as a *tamasha*. It is for the sake of these persons who form by far the largest proportion of visitors that the Amusement Section is especially designed, and I feel sure that my Committee, were the Exhibition to be held again, would be prepared to spend even a larger amount of money on the provision of amusements. The chief items on this occasion were the Shannon river, the switch back, razzle-dazzle, mystic swing, the crystal maze and the magic mirror. The section was under the immediate personal charge of a committee of local gentlemen who devoted a great deal of their time to controlling the staff and organising the section, and with the greatest success.

The programme of the Exhibition included a Military Tournament Week, an Agricultural Week with a Cattle and Flower Show, and a Motor Trial Week during the Christmas holidays. This last was not under the control of the Exhibition, but a grant was made towards its funds by the Exhibition Committee, as it was thought that it

would prove a great attraction to visitors from Bombay and Calcutta.

Wrestling matches were also held on Sundays, and Purdah days were allowed during the first few Thursdays of the Exhibition.

It may be asked, and I doubt not it very often is asked, what is the practical use of holding an exhibition. Without entering into the general question, I can point to several matters where the recent Central Provinces and Berar Exhibition will be of definite assistance to workers in the industrial field.

The use of the Agricultural Section no one, I think, will venture to question. Tens of thousands of cultivators have seen the improved machines in actual operation and have purchased large numbers of them. The Cawnpore pump, the Harder fodder cutter, the Nahan sugar-cane mill, among other useful implements, have been made known to many who would not otherwise have had a chance of seeing them. Improved methods of rice transplanting have been demonstrated before a large number of Chhattisgarh cultivators, many of whom have expressed their intention of adopting them next year. Explanations of the various pests that injure crops have been given to ever new audiences. Cultivators have had an opportunity of seeing new crops or new varieties of crops well known to them, displayed in a way to show them the various points wherein these differed from the products already familiar to them. Finally the method and arrangement were of help and interest to the agricultural student or even to the agricultural expert from outside the province, no less than to the agriculturists themselves.

It is when we turn to the Industrial Section that the case is at first sight less clear. There is, it must be confessed, a great deal of mere advertisement of manufactured articles that is of no-use to any one, though it adds to the spectacular interest of the show. Among such I would

class Messrs. Lipton's and Nestle's and the innumerable vendors of patent medicines.

But taking each section individually, there is still much of real benefit left, to point to. In the Weaving Section, as has already been pointed out above, the necessary fillip to the interest of the weaver classes in the new loom has been provided by the Handloom Competition, rendered infinitely more impressive to the mind of the village weaver by all the pomp and circumstance of an exhibition. I fear that the display of the hand-woven country cloths of various kinds served little use, beyond showing the weavers of one district what was made in another, as the spectators did not seem to care to put their *Swadeshi* principles to the practical test of spending money on hand-made articles.

In the Wood and Metal Section, much interest of a practical nature was aroused in the wood-carving done in Nagpur and the Maratha country, which, it is hoped, will lead to an improved demand for such work. The general public were made aware of the numerous and excellent Indian manufacturers of all sorts of iron trunks, dispatch boxes, lamps, locks and similar wares. In the Miscellaneous Section a good advertisement was obtained for several Indian leather-making firms which sold a fair number of articles during the Exhibition and secured a number of prospective customers. The wares of the Madras Aluminium Co., were for the first time seen by the dwellers in the land-locked villages of this remote part of India and secured a ready sale.

The Ladies' Section aroused the greatest interest among the ladies not only of the Central Provinces and Berar but of other parts of India too, and undoubtedly did its part in carrying on and stimulating the efforts that are being made to widen the life-interests of Indian women.

Besides these definite and palpable ends obtained by individual classes of exhibits, there is the general but undeniable effect on the Indian industrial world of such an

Exhibition just at present. Everything is valuable that tends to emphasise the industrial self-consciousness of India ; that will show capitalists to what an extent and with what success small industries are being carried on over India ; that will encourage the small and struggling manufacturer with a sight of what his brothers and rivals are doing in other parts of the country ; that will enable all interested in the industrial regeneration of India to point to the outside world the result of their economic stock-taking and to challenge denial to their claim that real and substantial progress has already been made and that hopes of even better things are to be found therein. Finally the educative effects on so backward a people as those of the C. P. must not be overlooked. The imbibing of new ideas always produces greater receptivity for still newer ones ; people who have had the electric light and the X-rays held out before them as a spectacle and have gazed from close by at all sorts of complicated machinery in motion should be less ready to believe in the absurd and often malevolent rumours that anything new or startling usually gives rise to and should be more prepared to credit the truths of science when placed before them in a simple form for their benefit—nay, often for the preservation of their lives.

I do not know if it will be out of place here to say a word or two on behalf of my Committee and my fellow-workers, official and unofficial, but this paper will indeed have failed in its objects if it has not clearly shown how much the Exhibition owed to the spirit of good fellowship that prevailed amongst one and all ; and I count it not the least of the benefits of the Exhibition that it has taught officials how much assistance can be obtained from the unofficial classes, has shown the unofficial members the readiness of their official colleagues to work with them on terms of friendly equality, and has given an object-lesson to all of harmonious and friendly co-operation.

THE INDUSTRIAL ASCENDANCY OF THE NATIONS.

BY C. GOPAL MENON, ESQ., F.I.C., etc., *Madras*.

The industrial ascendancy of the nations is a vast subject bearing directly upon the growth of nations in wealth and population, the social condition and aptitudes of their people, the national resources and their prospects together with the economic changes that have taken place in the country from time to time. In reviewing the subject a great deal has to be said in regard to the struggle which nations had to undergo for establishing a place for themselves in the present industrial and manufacturing world. It is, in fact, a survey of the industrial progress which the different nations of the world have made.

The struggle of the nations for industrial ascendancy dates back to the period of European expansion which was effected with a view to the attainment of industrial and commercial ends. Sometimes it is one country, and then another, which seems to have attained the objects aimed at. Sometimes it is one nation, then another, which rises to the highest industrial and commercial development and prosperity, only afterwards to be thrust aside by more intelligent and more energetic competitors.

Industry and commerce go hand in hand. It is difficult to dissociate one from the other. The problems concerning industry and commerce are so closely associated, that it is hardly possible to speak of the one without the other, and hence in this paper reference is made—where absolutely necessary—to the commercial struggle which nations had to undergo in order to find an outlet for their manufactured products.

Industry differs from commerce in that it brings into existence new material products of human labour. It employs labour in the production and shaping of nature's products for the comfort and convenience of man. Commerce is the exchange of raw materials and finished articles and

transports it from place to place. Commerce makes the abundance of one country available to meet the scarcity of another, effects an interchange of goods so as to afford the greatest satisfaction and advantage to the parties interested. Commerce is the exchange of commodities for commodities and implies a division of labour and these two factors are aptly called 'the organised process of creating wealth.' Exchange of commodities is the process of bringing the different soils, climes and natural geographical conditions into an organic relation, while the division of labour is the organisation of skill and industry of human beings.

I shall, before touching upon the industrial development of modern times, deal with the struggles of the nations of the earliest period for the extension of trade to accumulate wealth and power.

In the primitive stage man satisfies his wants and desires by fishing and hunting and never troubles himself to manufacture and thus stimulate industrial activity. Even if he does take trouble to co-operate nature's bounty with her forces it is only in a most meagre and simple fashion, for his wants are so few that he can satisfy them by directing his efforts to a very moderate extent. Robinson Crusoe, on a lonely island, would produce only for the satisfaction of his own wants, but in the modern specialised industrial world he would produce for profits. With the increase of population dependence on nature's bounty alone makes men's position precarious and the pastoral stage begins with the rearing of pastoral animals for food and clothing. This is the nomadic stage of man, but a new element comes into existence in the form of private property. Wealth, though produced at this stage, will not be to such an extent as to lead to exchange and commerce. In this barter stage of commerce there cannot exist any parity in supply and demand. With the advent of the agricultural stage, population begins to increase, the nomadic stage ceases and man goes into an organic society with the recognition of private ownership in land, houses and other forms of property.

Finally the industrial stage is reached, with which we are at present concerned, wherein man not only labours to meet his own requirements, but also for those of others. This brings about industrial inter-dependence among the different nationalities and a close relationship amongst them. This intercourse between the peoples of different countries effects an interchange of ideas and an elevation of intellectual and moral development among the races.

In the early times the history of trade was greatly effected by the discovery of the trade routes between the East and the West. The voyages between these two portions of the world gave rise to two well-defined commercial routes, one through Central Asia, by the Caspian Sea and the other along the Persian Gulf, the Euphrates River and through Alexandria. A great stimulus to these voyages was given in the middle of the first century by the discovery of the Monsoon winds blowing in winter from the north-east, and in summer from the south-west, along the shores of the Indian Ocean, which greatly developed the Levant trade.

The Mediterranean Sea thus became the centre of industrial and commercial activities even from the very earliest period. The Phœnicians did their utmost to extend trade and industry in the face of the greatest danger by discovering new countries and opening up new markets for their wares. Their work was continued by the Carthaginians, who were pushed aside by the Greeks and the Romans.

The centre of activities now passed westward, the Greeks and the Romans contending for commercial supremacy. In the middle of the second century industry and commerce took their shape and colour from the policy of the Roman Empire. During their *regime*, Levant trade prospered; the trip from China to Syria took eight months, but it was gladly undertaken for the large rewards expected.

Marseilles, Genoa, Pisa and Venice all reached a position of immense prosperity and kept up trade relations

with Asia Minor, and in their fleets the Crusaders of Northern Europe proceeded to the Holy Land, and the trade route to Asia was diverted from the Danube to the Alps. As a result of the voyages of the Crusaders many eastern industries were brought into Europe and the intercourse between the East and the West was promoted greatly by the pilgrims to the Holy Land. These voyages had the effect of developing European civilisation and the introduction into Europe of the mariner's compass, the printing press and gun-powder. The Pilgrims also took several eastern products, such as silks, spices, paper, &c.

This was followed by an eventful epoch in Europe. It was the period of the greatest outward activity of mankind, the period of voyages, enterprises, discoveries and inventions of all sorts. It was at this time that the greatest expeditions of the Portuguese along the coasts of Africa took place which resulted in the discovery of the passage by the Cape of Good Hope. It is no longer the Mediterranean, but the Atlantic Ocean that becomes the centre of international commerce. The Iberian Peninsula comes more and more to the front. Columbus discovered America, Vasco de Gama reached Calicut by the way of the Cape of Good Hope.

We now come to the middle of the fifteenth century, by which time the greatness of the Eastern Empire was overthrown by the Turks. Europe was at this period quite ignorant of the conditions in the oriental countries except for the scanty information obtained through the writings of Marco Polo that fabulous wealth existed in the mysterious East. Several voyages were undertaken to find out the shortest route to the Indies, which led Columbus to the discovery of the New world.

In his remarkable lectures on 'The Expansion of England', Sir John Seeley says that the discovery of the New World transformed the politics of Europe by altering materially the interests and the position of the five great European States. Spain and Portugal attained the

highest pre-eminence in the 16th century. The voyages of Vasco de Gama were soon followed by that of Pedro Alvarez Cabral, who arrived on the Malabar coast in 1501 and established trading stations at Cochin and Cannanore. Lisbon thus became the chief emporium for all East Indian products.

During the 17th century the powers bordering the Atlantic joined the struggle for commercial empire and by the eighteenth century the power of Spain and Portugal began to languish—the haughty and arbitrary attitude, the bullion policy and their mistaken colonial policy led to weaken the Spanish Empire once so powerful, and gave rise to serious foreign complications and finally caused the loss of the most precious pearl in the crown of Castile, through the declaration of the Independence of Holland.

The immense wealth which the Spaniards brought from Mexico and Peru made them look upon industry as a low and base profession and they never cared to foster industrial development of their country. Nor were they able to keep in custody the treasure obtained owing to the costly wars undertaken by Charles V. and the luxurious extravagance of Phillip II. The few industries established were not enough to maintain the position of Spain and the little wealth that remained, gradually found its way to such commercial and industrial centres, as Genoa, Amsterdam and Antwerp.

Holland, which had already occupied, before the Peace of Munster, an important position in commerce, industry and navigation, now began to displace the Spaniards in the world's commerce. Their wares commended themselves from the very outset for the excellence of their manufacture. Their woollen industry was exceedingly prosperous. Their fiscal policy was peculiar at the time. The Dutch, seeing the evil effects of protection in Spain, abolished all tolls and removed all hindrances to the development of trade and industry and it was in the Dutch markets that the nations of the world met to exchange their wares, and to transact their international business. The Dutch

East India Company, which played such an important part in the oriental trade and enjoyed such unexcelled prosperity, gradually fell before the energetic and centralized rivalry of France and England. France, which had by this time become the most successful industrial power on the continent and the English who had already begun to show the germs of their great commercial and industrial supremacy, contemplated with feelings of envy the enormous material development of that small country of fishermen and shopkeepers, as Louis XIV. used to call them. Colbert with his tariff war, and Cromwell with his Navigation Act, both of whom played such a conspicuous part in the industrial development of their respective countries, each of them separately and collectively strove to destroy Dutch industry, Dutch commerce and Dutch supremacy on the sea.

The economic policy of the Dutch traders was not altogether free from fallacies. Their enterprises were begun in the most liberal manner and in accordance with the doctrine of the age, but later on the importation of oriental goods was restricted by rigorous measures, which tended to hasten the decline of their industrial and commercial predominance.

At this time England and France were fighting for supremacy in India and North America. In India, the fate of France was decided once for all at the battle of Plassey and in North America at the heights of Abraham. These defeats determined once for all England's supremacy over the seas. England became mistress after the ruin of Spain and France as Rome had risen on the ruins of Tyre and Carthage.

It is hardly possible in this paper to touch upon the principal economic factors of the age, on the doctrine of money or on the balance of trade. It is sufficient to say that through the writings of Adam Smith, the theory of mercantilism was completely overthrown and a new epoch in economic science was opened. Mercantilism based on

nationalism was superseded by cosmopolitanism and the doctrine of natural law and natural rights.

We now come to the threshold of the nineteenth century. While England was busy establishing her colonial empire and her supremacy on the sea, there came that series of transforming and striking inventions, which precipitated the industrial revolution and transformed industrial conditions, not only in Europe but throughout the world. These inventions revolutionised the industrial methods of the great powers and brought about wonderful progress in their commerce. The insular position of England gave security to those men of genius—those humble workmen—who merely in quest of their daily bread, fed and clothed multitudes with the results of their inventions. This age of scientific invention is the natural sequence of the physical discoveries which preceded it. Although England cannot claim a Columbus or Magellan, the names of Kay, Hargreaves, Arkwright, Crompton, Cartwright, Watt, Boulton, Horrocks, Roberts, Bulloigh, Smeaton, Stephenson, Brindley, Clement and others are so well known, as masters over nature's forces. In a study of the manufacturing countries, Britain claims more attention than all other nations of the world, for here is the seat and throne of manufactures. That development rests upon the steam engine of Watt, the steamship of Symington and the locomotive of Stephenson. Here is the great triad which has built up the modern material world. The age of geographical discovery thus paved the way for the age of invention and expansion, and England's success in trade and industry became an accomplished fact. English shipping opened up new markets and an unlimited supply of her manufactures was thrown on these markets. England's enormous profits, industrial and commercial, made her the financial and economic centre of the world. The inventions of Arkwright, Hargreaves and Cartwright brought economical shipping and weaving of textiles; those of Nelson and Cort, cheap iron: those of Bessemer, Siemens,

Martin and Thomas, cheap steel, the most important article for making not only edged tools, but also the basic element of so many other articles. With the advent of this industrial period and growth of population, Britain produced more iron and steel, manufactured more machinery, mined more coal, wove more cloth, than all the rest of the countries in the world.

A short notice of the economic policy of England at this period is necessary to show her mistaken colonial policy. It is to the credit of England that she did everything to promote the development of industry and commerce, but this was greatly hampered by her adherence to Protectionist policy. This arrested the development of international trade already suffering from the effects of the Navigation Act of 1651; owing to excessive duties England's imports decreased. Moreover, the tariff policy of England was the cause of rupture between England and her greatest colony, America, where loud complaints were raised against the monopoly England had obtained by the Navigation Act of Charles II. Great discontent prevailed in America, and to add to it, several new unpopular taxes were imposed. These iniquitous measures, which were regarded as tyrannical by the Americans, led first to the Congress of Philadelphia in 1774, where it was solemnly declared that the Americans would not import any more goods from England nor export any produce to the mother country, and eventually on 4th July 1776, to the Declaration of Independence, followed by a war which, lasting for many years, was concluded in 1783 by England recognising the independence of the United States of America.

The loss of this colony to England was a hard blow indeed but her trade relations with America underwent a sudden and marked change. Events which had taken place on the continent of Europe, *viz.*, the Revolution in France, helped England further to extend her trade to all parts of the world. After the United States became independent a large number of emigrants crossed the Atlantic

from the Old to the New World. The immigration of intelligent and skilful labour is an important factor in the attainment of industrial greatness. English industry flourished on account of immigrants from Flanders, just as later on Japanese industry was profited in the same way by immigrants from Korea and China. The United States, richly endowed by nature and containing men of different nationalities who represented the intelligence and culture of the world, could not but make rapid strides in industrial development. While things were undergoing rapid changes all over the world, a small band of England's patriotic statesmen contributed to greater prosperity by a change of fiscal policy which gave cheaper food to the workers and in every way stimulated manufacturing activity. Huskisson, Cobden, John Bright, Villiers and Robert Peel are those whose names stand written in golden letters in the economic history of Great Britain. In 1846 England threw away her mantle of protection and clothed herself in Free Trade. But for this change, England's commerce would never have reached its present dimensions nor enabled her to maintain her trade predominance.

The Franco-Prussian War of 1870 resulted in the transfer of five milliards of francs of war indemnity across the Rhine. This was enough for Germany to establish her brilliant position. The battle of Sedan put an end to the dominating position of France in Europe, and opened the way for German States to unite into one Empire. In the middle ages, German commerce had already manifested its strength and the big industrial cities of Germany had created commercial cities or Hanses. Germany began to prosper during the regime of her greatest statesman, Otto Von Bismarck. The habits, conditions, intelligence, and spirit of the masses are important elements in an industrial race and in this respect, the German is a valuable man—steady, sober, methodical, thorough, self-respecting, and he is also an admirable workman and superintendent.

Germany excels in her product of steel which is now second only to that of the United States. Her shipping is one of the most gigantic in the world. The speed of her steamships on the vast oceans is supreme. German mail boats obtained subsidies for German steam lines to all parts of the globe. These ships vie with English boats in comfort, discipline and speed. The Iron Chancellor was fully alive to the immense good England had derived from Free Trade, so he became a free trader as among the States of the Empire and abolished customs duties between one state and another. He transferred the management of railways to the Government, introduced one set of weights, measures and coins for the whole of Germany, effected monetary reforms and founded the Imperial Bank, in fact he did everything to attract the attention of the civilised world to Berlin.

A number of industrial undertakings started throughout Germany at this period, was brought to ruin owing to the unsound constitution on which they were based; over-production and over-trading were the result. American and Russian wheat poured into the country and the agricultural classes began to suffer. A decline in general prices and an economic crisis ensued. The State resorted to artificial remedies, abolished free trade, levied all sorts of prohibitive duties against foreign competition. A revival took place.

The United States, after the Declaration of Independence, began to prosper by leaps and bounds. They firmly grasped the motto 'United we stand, divided we fall.' She now ranks as a great, if not the greatest manufacturing country in the world. Her production in iron and coal is the greatest, so also in wool and silk. America produces three-fourths of the cotton grown in the world. The value of her manufactures is three times greater than that of England. Her food products, her railway mileage and her clearing house are greater than those of any other country. The huge industrial combinations or trusts that

are formed in America leave little room for small enterprises to exist. The millionaire begins by financing and ends by absorbing them. The resources of America are so vast and the raw materials so ample that it may be said that there is not even a single article which is manufactured in other parts of the globe that could not be made in the United States at the present day.

In comparison with England, Germany and the United States others are only of trifling moment in the production of staple articles for export. Belgium for its size is the most wonderful of all manufacturing nations and her exports and imports *per capita* much exceed those of Britain.

France has a monopoly in several articles. She maintains a unique position in her silk, woollen and wine trade, as also in leather goods. France has a pre-eminent position in motor-machinery.

We come next to Switzerland the land of watch manufacture by hand. It is a decent little manufacturing country and the Swiss are often described as the Scots of Continental Europe.

Little Denmark has only a population not much exceeding two millions and her exports in butter, bacon and eggs are larger than those of any other country. Norway, Sweden and Holland, each send several millions worth of butter to different parts of the world and the latter also sends cheese, valued at over three to four millions sterling. These facts only show the resources of these countries and the efficient manner in which they are utilised.

It is beyond the scope of this paper to deal with more than the general outline of industrial development of the different nations of the world. I have, however, traversed the ground as far as it lay in my power. One country that strikes us most in industrial development within a short period of 40 to 50 years is Japan. For many centuries she led a life of exclusion. She has now risen from her lethargy and is as much concerned with these world-movements as

any other country. Japan lies directly at the gateway of the Western Pacific. By her geographical situation, she is eminently fitted to rank as a great industrial and commercial nation. Her soil and climate, the character of her people and the existence of markets like China and the United States on either side and Russian Siberia and Australasia to the North and South, all afford ample facilities for her national growth.

A country's industry is regulated by its natural resources and the skill of its inhabitants to convert them into finished articles. Japan, for instance, has immense stores of coal, the chief generative power of the industrial world. Her geographical position is such as to enable her to lay her hands readily on the world's raw materials from every side. Organization for industrial and commercial purposes, which is so essential for a nation, the Japanese are capable of. Her forty millions of people have astonished the world by their ingenuity and adaptability in arts, industries and trade.

In China and Japan, the textile industry has taken firm root. Attempts have been made in Japan to make warships from home products. Japan's greatness is her ability to prudently adopt scientific methods of production on a gigantic scale. The Empire of the Rising Sun is gradually becoming the workshop and the carrier of the East. She is in friendly rivalry with other nations and she sends out to other parts of the world chiefly refined copper, coarse copper, camphor, all sorts of Japanese cabinet boxes, umbrellas, screens and several other manufactures made of cane, wood, buffalo and other horns, stones, paper, rice, tea, spices and glassware, &c.

I have so far dealt with the progress of manufacturing industries of the different nations of the world, bringing out prominently the expansion which has been so marked a feature of the first quarter or half of the nineteenth century. That pre-eminence was due to the inventive genius of a small band of patriotic Englishmen, which has made

it possible to turn out cloth, manufactured metal goods, and in fact everything required for human use by machine process. This knowledge and practice of manufacture by machine is spreading widely and is seen exhibited in a remarkable degree in Germany and the United States at the present day. In the Far East, Japan has been imitating the Western methods with wonderful success and abundant results.

It is this process of manufactures, saving both labour and expense in production, that has crippled the industries which were once so flourishing in India. It is often alleged that India has been an agricultural country from time immemorial and that it is well worth the attention of the Indian people to sink their wealth in land. It is true that Oriental countries are mainly agricultural but it cannot be asserted that the material wealth of India originated before its occupation by the Western nations from land alone and not from manufactures. We have ample evidence of India's excellent capabilities and admirable skill in manufacturing industries. Certain special handicrafts are lost to-day, not only to India, but also to the world. The finest Dacca muslins, Cashmere shawls, Bengal silks, Agra marbles, have dazzled the eyes of the world. During the early days of European intercourse with India, the presents consisted of Cashmere shawls worth about, or at least a thousand or two thousand pounds. Further the temples, mosques and other works of architecture which are the past story of India, and which have been admired and acknowledged as symbols of an ancient civilisation, are the work of the Indian artisan. Nor was Indian skill wanting in the manufacture of wrought iron. Iron industry in India had once attained its excellence as may be seen from the fact that Indian wootz (steel) furnished the material for the manufacture of Damascus blades. The Indian steel was much sought after for the manufacture of cutlery and was pronounced by Sheffield merchants to be superior

to any produced in England. India is, no doubt, an exceedingly rich country in minerals. The metal industry was, however, attended with one great drawback in those days, viz., the insufficiency of fuel supply. Charcoal fuel was not so economical for metallurgical industries as ordinary coal. Owing to this defect, some of the iron work companies, organised in the first quarter of the last century, met with little or no success. It is mainly enterprise that is required to work successfully mines which will produce coal and gold and other minerals, such as iron, copper, &c.

The arts of cotton spinning and weaving had reached a high stage of proficiency in India many years ago. The cloths of Masulipatam and the muslins of Dacca were known in Eastern markets in those early days. Surat cotton was considered to be the best and a good quality of cotton was grown in the district of Tinnevely. All the cotton was spun by hand in India. India once had an equally good trade in several other articles such as Indian silks, indigo, sugar, tobacco, dyes, &c.

In the place of all these old industries for which India was noted from its earliest days, we now find new ones, most of which in the words of Mr. J. A. Baines, C.S.I., 'are in the hands of Europeans, so that only the price of labour remains in the country.' The older industries benefited the masses of India, and as new ones gave employment only to a very limited number of people, the Indian manufacturer and artisan found themselves in a state of abject poverty and decline. The people having had no work, began to fall back upon agriculture, the only national industry of the people. Mr. R. C. Dutt in his *Economic History of British India* attributes this to the jealous commercial policy of Great Britain towards India. He says that Britain's policy in the early years of the Nineteenth Century towards India was the same as that pursued by her at the time towards Ireland and her colonies. Endeavours were made, which were fatally successful, to repress Indian manufactures and to extend British ones. The import of

Indian goods to Europe was repressed by prohibitive duties; the export of British goods to India was encouraged by almost nominal duties.

Contemporaneous with this age of industrial decline in India, brought about solely by Governmental interference, the method of production and the organization of industrial society in Europe underwent surprising changes. The domestic stage of industry became transformed into the factory system, and the centre of economic power shifted from the landed aristocracies to the capitalist class. Facility of transportation and communication widened the sphere of supply and demand from the home market to the outside world. The opening of the Suez Canal in 1869 shortened the voyage between India and England by 5,000 miles. The bulk of trade in the early part of the nineteenth century consisted in the exports of manufactured products from India to England, instead of imports from the latter country as at present.

We have sufficient supply of natural products, we want ability and skill to convert these natural resources to meet the necessities of life and cater to the demands for luxury. Our textile industry is taking firm root in the country. Almost a half of the cotton grown in India is now consumed in her Spinning Mills. She is able to spare about 7,397,000 cwts. of cotton valued at about Rs. 21,96,57,000, all of which is exported to foreign countries. It should be our aim to extend our mill industry and consume in India as much as possible of the remaining half of this commodity.

Another great export of India is in hides and skins, which is estimated at over ten millions sterling per annum. Of this, 90 % is exported to the foreign countries, and only 10 % is utilised for manufacture in India. It is, therefore, evident that, notwithstanding the excellent tanning materials that exist in the country, we are not able to convert the greater portion of this raw produce into the different processes of tanning, curing, dyeing, dressing

and shoe or boot making. This is of course, a deplorable state of things, but it is hoped that the young Indians who are being trained in Europe might be of service to develop this industry. In order to make this industry profitable, it must be carried on an extensive scale by organized bodies and consolidated capital.

I am afraid my paper has already become lengthy. I shall, therefore, take a rapid survey of some of the other articles that could with immense advantage be made into staple articles in India. The jute industry, once centred in Dundee, is now established in India, near the jute supply; the production of jute in India has now amounted to about 31,733,000 cwts.

The coal resources of India and their development have attracted the attention of people, as its importance is intimately bound up with the general prosperity of a nation. A cheap supply of coal is a great desideratum, not only for great metallurgical industries, but also for ships, railways and factories. That India possesses a practically inexhaustible supply of coal is a fact that has now become widely known as may be seen from the returns of the Indian collieries. The total output from these collieries has been over 6,000,000 tons for the past year, Bengal contributing nearly 5,000,000.

In regard to the iron and steel industry, the efforts of the late Mr. J. N. Tata must be mentioned. When Tata's works begin to turn out iron and steel, this supply, together with the resources already in existence, would be enough to meet the requirements of these metals to a very great extent. The import of iron and steel at present is about 755 lakhs of rupees worth.

The two articles on which India spends more money than on any other are oil and sugar. India exports seeds every year to the extent of Rs. 1,300 lakhs, and it is a matter for grief that we are not taking adequate steps to press these seeds into oil in India.

India is in the fullest sense the home of the sugar.

cane. Many centuries before the West Indian Islands received it from Portuguese and Spanish settlers, it was grown in India. While in Continental Europe the scientific cultivation and treatment of beet-root has been revolutionising the industry, it is surprising that in India the yield per acre is still only one ton or less. These are only a few of the most important articles which India could with advantage manufacture to meet the home demand.

The present industrial awakening in India is, without doubt, a fit opportunity to develop new industries, but to lay the foundation-stone of a great edifice, on which will depend the destiny of a rising nation, consisting of one-fifth of the whole human race, is beset with great difficulties. Every step taken must be a considered one. We must carefully examine the different methods employed by other nations, and especially those of the West and study their present state in order to avoid mistakes. We have an abundance of labour at low wages, but our men do not understand the use of modern complex machinery. Investment in an industrial enterprise does not yield as much present profit as simple money-lending does. Government help in more ways than one is absolutely needed if industries are to thrive in India again. Industry flourished in ancient days because of the encouragement accorded to the people by the Hindu and Mahomedan sovereigns. An interesting point in a discussion of industrial questions is whether 'Protection' or 'Free-trade' is more favourable to the country. This is a subject on which Indian opinion is divided. A certain class of people maintain that Protection is necessary to foster our industries, but others accept the scientific truth and doctrine of Free-trade. It is, however, pointed out that in the case of infant industries some sort of temporary protection is necessary until the industry can stand on its own legs. Scarcity of capital and want of skill and experience make it necessary to protect nascent industries. A protective tariff may also be required within certain limits by a class of industries. Under all other

circumstances complete *liberty of trade and industry* is what is looked for. Professor Bastable summarises admirably the cardinal points of free trade policy : ' In every particular exchange there is necessarily a gain to each party concerned, but the sum total of exchange is composed of the several particular exchanges which have been made ; and as each of the latter implies a gain, the immediate result must be beneficial.

There is one other point to be noticed. It is often asserted that Indians have not passed the stage of individual life and are not yet for corporate life such as is found in European countries. Without this corporate life, which is the foundation of the numerous joint-stock companies, no great commercial or industrial development can take place. Individual exertion cannot do much and huge undertakings can be conducted only by corporate bodies. It is believed that owing to the existence of a complexity of castes in India, the people are incapable of combining. The caste system is not altogether an unmixed evil, and a great many of the castes, being founded on hereditary occupation, form trade guilds or societies, having their own committees of management and rules and regulations, fines, etc. These are not altogether different from the old trade-guilds and modern unions in the countries of the West. Caste defines a man's position and duties and his physical adaptability to particular lines of industry, which should be considered a natural resource, and its commercial value is of the highest importance. In fact the caste system has an industrial foundation and is a remarkable ancient fabric which may form the basis of any system of commercial co-operation. It is alleged that Indians are incapable of managing a business in common. Evidences are not wanting of the existence of a spirit of co-operation in the community. To quote an instance I may point to the village communities of India. The village was held in common and cultivated by a joint stock of labour, cattle and implements the produce being shared by the members of the village

community according to their respective shares. There is neither time nor space to review the great works carried out and maintained in India by these village communities before the British occupation. The great corporations formed for the purpose of carrying out these great industrial undertakings such as an irrigation work or the erection of a temple or even the administration of a village or town in those days, had all the features of a highly organised society, like one of the Cantons of the Swiss Republic. We have the germs of corporate life in us and we only require that quality to be developed to its highest pitch.

Before concluding this paper, I have one more word to say with regard to finance. At present commerce and industry are greatly hindered and hampered on account of the lack of money. Money must be found to make money. The method of finding money to finance a great industrial concern or a trade is perhaps the most important which arises in the modern business world. The science of financing is the method of raising money by contribution, and in the employment of it in loans for carrying out public or commercial concerns. In Europe, the science of banking business has reached a stage of perfection which admits of the financing of any great undertaking through the medium of bankers. The art of banking in India is still in its rudimentary stage; there is a great deal of money-lending at an exorbitant rate but there are no facilities for raising money at cheap rates for industrial purposes. Mutual credit is at a low ebb. In order to achieve eminence in the new era of industrial development, a great amount of financial capacity, skill, insight and knowledge of financial operations is necessary. The business man and the industrial captain of to-day must possess that talent to turn his capital much oftener than his forefathers did. Young Indians must learn financing in all its aspects. Many financial and industrial undertakings in India would have given far better results if the

problem of financing had not been neglected, if those who had to buy or sell in foreign countries had chosen the proper time to operate. This knowledge is obtained by the study of economic, financial and monetary problems and these have become so prominent and they occupy such an important place in the history of any nation, that they cannot be too carefully studied. Especially banking and finance are a science which must be closely followed and practised, just as any other science. The time and pains that one bestows upon them will be amply rewarded.

IMPROVEMENTS IN AGRICULTURE IN SOUTHERN INDIA.

BY M. R. RAMAKRISHNA IYER, ESQ.,
*High Court Vakil and Secretary of the District Agricultural
Association, Tinnevely.*

Speaking of Agriculture, a great classical poet has observed—

‘Who ploughing eat their food, they truly live;
The rest to others bend subservient, eating what they give.’
‘The ploughers are the linch-pin of the world; they bear
Them up who other works perform, too weak its toils to share.’

The same truth almost is expressed by the great scientist Baron Leibig in the following words:—

‘Perfect Agriculture is the foundation of all trade and industry—is the foundation of the riches of a state.’

Agriculture is the basic industry, the industry on which most of the other industries depend. In considering therefore the question of the development of various industries, we have to pay special regard in the first place to the development of agriculture, which in fact is the mother industry. The prominence which agriculture deserves becomes emphasized when we realise that about 80 per cent. of the population of this country depend upon agriculture for their living. From the earliest times agriculture has been practised as an art in most countries, and in India, the methods adopted in the different stages of cultivation have proceeded upon sound lines. There are several ex-

amples given by Mr. J. W. Mollison, the Inspector-General of Agriculture, of what he calls 'the fundamental soundness of the traditional agricultural practice of the country. One illustration of this is the common plan of combining a pulse crop with a cereal. For one thing, in this land of uncertain harvests, the cultivator knows by experience that the risk of total failure is minimised by growing a mixed crop. If the pulse fails, the wheat, jowar or bajri may succeed, and *vice versa*. But what the cultivator does not know is that these pulses enrich the soil with nitrogen of which element Indian soils require a frequently renewed supply.' Similarly many an Indian ryot has recourse to a regular rotation of crops, including leguminous crops in the rotation. He knows generally that the alternation of legumes with other crops in succession is beneficial, but he cannot say how or why it is so. In some parts of the country the agricultural practice is considered so good, that it is difficult to suggest an improvement, regard being had to the conditions prevailing. About the ryot himself, Dr. Voelcker observes that at his best, the Indian ryot or cultivator is quite as good as, and in some respects the superior of, the average British farmer, while at his worst, it can only be said that this state is brought about largely by an absence of facilities for improvement, which is probably unequalled in any other country, and that the ryot will struggle on patiently and uncomplainingly in the face of difficulties in a way that no one else would. 'He is not inclined to run any risk, nor can he afford to experiment, but he will not hesitate to adopt an improvement if it is shown that it constitutes a better plan, and one to his advantage.'

2. Nevertheless, it is a fact that agriculture in India has not been advancing at any appreciable pace. Speaking generally, we have not found any new or improved methods adopted in regard to cultivation during the last thirty years, and the agricultural practices have remained almost stationary except in a few isolated instances which have come to notice in recent years. One main reason for this state of

things is the want of knowledge on the part of the ryot of the principles of agriculture. Even where an agricultural practice is really good, the ryot is not aware of the general principle underlying it, so that he may apply it to other cases with which he has to deal. It is not that we want a number of ryots to become experts in any degree in agricultural science, but what is needed is, that a good portion of them should be made acquainted with the more obvious and primary principles applicable to agriculture in general. Besides knowing the practices, they ought to learn something of agriculture as a science. Again, the educated classes have not yet taken to agriculture as a profession. When they learn the principles of agriculture and become practical farmers, there is no doubt that India will soon occupy a much higher position than it does as an agricultural country.

3. Agriculture as a science has been but of recent growth even in the advanced countries of Europe and America. But during this comparatively short period results of vast importance have been achieved. From the spread of education among farmers, from the application of the principles of chemistry and other sciences to agriculture and the publication of the results of investigations and experiments in various agricultural stations maintained at the cost of the state, information and facilities have been so abundantly placed within the reach of the agriculturists in the different provinces of the United States that one would hardly be surprised at the large profits which the farmers there are able to earn and at the prosperity of the agricultural classes in general. Now that the Governments of the different provinces of India have been interesting themselves in agriculture, starting agricultural stations, and taking other measures for the introduction of improved methods, for which we feel highly thankful, we trust that with their help and guidance, we may soon be enabled to secure those advantages which the farmers of America are already enjoying. But our Government alone cannot do all that is

needed in this matter. They can only help those who help themselves. The landowners must by individual and concerted action themselves try to introduce here those rational and improved methods of agriculture which have proved so successful in Western countries. It is true that our conditions of climate, rainfall, &c., are very different from what prevail in those countries. Nevertheless, there are many matters in regard to which we can with great advantage and profit, adopt the Western methods of agriculture, modifying them where needed so as to suit our means and requirements. It is proposed, in this paper, to indicate a few such matters. There may not be anything new or original in what is stated here, either as regards the principles or the practices followed, but our conditions being different from those of the countries where the principles are applied and the practices followed, every successful attempt to introduce the same in this country deserves to be laid before the public, as showing the feasibility of their introduction and as serving to encourage farmers who interest themselves in improved agriculture.

4. The object of the farmer is 'to raise from a given extent of land the largest quantity of the most valuable produce at the least cost, in the shortest period of time, and with the least permanent injury to the soil; the rearing of stock in the most efficient and economical method; and the production of dairy produce.' The first matter that is to engage our attention in carrying out this object is the preparation of the soil for the growth of crops. 'Soil is the upper layer of earth which serves for the growth of plants.' It is the friable portion of the surface which can be tilled, and is capable of supporting vegetation. Soil forms a superficial layer of varying thickness.

5. 'To till the soil, and to till it well, is a primary condition of success in agriculture.' Tillage is generally effected by the operations of ploughing, cultivating and harrowing. By ploughing, which is the first step in the

process, the firm surface of the field is broken up. The instrument employed in Europe and America for ploughing is far more efficient than the plough of the Indian ryot. The European and the American plough not only penetrate and break up the soil but invert or reverse the surface soil, thereby exposing a new layer to the action of the weather. This is for the farmer an important consideration. Even as regards the breaking up of the land, the country plough can bear no comparison with the Western plough. The former scratches the soil, making V shaped furrows, and leaves ridges of land between unploughed. When the country plough works four inches deep, for instance, the furrow is five inches wide at the top and two inches at the bottom. So that even if the plough be worked by a trained man, with a good pair of bulls and under favourable conditions, there would be left ribs of earth untouched by the plough. But the European or American plough cuts a rectangular furrow having nearly the same uniform width from top to bottom and leaving no interstices unturned. Another advantage of this plough is, that it uproots the grasses and weeds which thereby become exposed to the action of the sun and are destroyed.

6. There are different kinds of ploughs in Europe and America, the chief of them being, (1) the ordinary swing plough, (2) the wheel plough, *i.e.*, the plough fitted with a single wheel or with two wheels which enable the husbandman to work the plough with ease and with a uniformity as regards the width and depth of the furrow, (3) and the digging plough which as it works, throws the soil loosely over and pulverizes it. There is also the recently invented sulky plough which is so constructed as to get rid of the sliding friction between the earth and the plough and to avoid the formation of hard pans at the bottom of the furrows.

7. These implements are doubtless effective in their work; but they are all unsuited to the present condition of the Indian ryot and his working cattle. It is,

however, satisfactory to find that the advantages of the ordinary European or American plough can to a great extent be secured by the employment of what are known as the 'improved ploughs.' These are constructed so as to suit the conditions here and are successfully worked by our ordinary cattle. The main parts of the body of an improved plough are made of iron as also the share and mould-board attached to it. The plough is provided with a wooden pole and stilt or handle and the adjustment for the bulls is the same as in the ordinary country plough. These ploughs are made by various firms and individuals. We have, for instance, Avery's Hindustan plough, the Cawnpore plough, the Watts' plough, the Meston plough, the Pipe plough and the Ryot's plough of Messrs. Massey & Co., and Nilakanta Asary's plough. The Agricultural Association, Tinnevely, has been making and selling ploughs of the pattern last mentioned; the price being between Rs. 6 and Rs. 7 a plough, while the cost of a European plough is almost prohibitive. The improved ploughs above mentioned work like the European or American plough, though they cannot turn out furrows of the same width and depth. They break up and invert the soil for a few inches and root out the weeds and grass; and an improved plough turns out from two to three times the amount of work of the ordinary country plough. One ploughing and cross ploughing with an improved plough* are sufficient completely to break up the whole field and there are no interstices or spaces left unturned. As regards breaking up fallow lands and lands overgrown with grass and weeds, this plough does the work with a thoroughness for which the country plough can hardly compete with it. The improved plough is suited to all lands, wet and dry, except to some classes

* Dr. Voelcker found, at a trial of improved ploughs at Meerut, that Watts' plough (from Allahabad) turned out good work. 'The soil was quite inverted, and it crumbled as it fell covering over the stubble completely, and leaving the appearance of the field far more even than in the case of the other ploughs.'

of purely clayey black soil lands. The paddy lands of Southern India are cultivated both on the dry system and the puddle system. To work the improved plough easily on puddled land, a slight modification is needed in the working parts. The share is made a little narrower and the mould-board so curved as to offer less resistance to the soil turned up.

One ploughing and cross ploughing with this plough produce the required puddle, and the weeds being completely uprooted rot in the field and become manure.* Again in ploughing, the earth turned up does not stick to the improved plough as it does to the country plough. In addition to its superior efficiency in general, the improved plough saves manual labour in the trimming of field bunds and clearing of headlands in paddy fields. In making ridges and furrows in dry and garden cultivation, manual labour could be saved by the use of this plough.

8. One great advantage gained by the adoption of this plough is the saving of time. In a country where the weather conditions allow but short periods for preparing the soil, it is of paramount importance for a farmer to be able to plough with this instrument nearly three times the area he could cover with his country plough. The utility of the improved plough was readily perceived and acknowledged by the ryots wherever demonstrations were given.

9. The question of the improved plough is dealt with here rather in detail because, notwithstanding certain objections raised, it is the most important agricultural implement which can with immense benefit to the ryots be introduced into this country. Of course no one would think of using this plough which inverts the soil, immediately before sowing; nor is it suggested that the country plough should be dispensed with altogether. The country plough is useful as a cultivator whose frequent working

* There are, however, certain weeds which though up-rooted and buried in the inverted soil spring up again. These have to be collected and removed.

produces a fine tilth so necessary for the growing of any crop. It has also various other uses. But what is strongly urged here is, that it would greatly tend to economy of time, labour and cattle, if the improved plough be employed to give the first two ploughings for fields wet or dry. The plough is not costly and an ordinary pair of bulls is capable of working it without difficulty. The improved plough itself admits of further improvements suited to the conditions of the country, and they could in due course be introduced without adding much to the cost.

10. Next to ploughing comes the process of harrowing, according to Western husbandry. The object of harrowing is to level the land ploughed, to pulverise the soil and to collect the weeds. In modern times it is considered desirable, before employing the harrow, to work an implement called the cultivator or grubber, which is of intermediate character betwixt the plough and the harrow. 'The grubber stirs the soil expeditiously to a depth of 5 to 9 inches without reversing it and uproots and brings the weeds and grasses unbroken to the surface. It breaks up furrows so that the lighter harrows may work more freely.' A three-tined (preferably a five-tined) grubber with chisel points or with duck-foot coulters could be made at a moderate cost so as to be worked by an ordinary pair of bulls. The land having been previously ploughed and cross ploughed, the draught will not be felt to be heavy. Where the country plough is employed in place of the grubber, it is desirable to fasten two such ploughs to a yoke, one plough having a somewhat longer pole than the other. The ploughs could work side by side, the working parts of one plough following a foot and a half behind those of the other.*

11. It appears that in Guzerat and certain other parts of the country, the ryots have a kind of harrow and grubber

* It has to be observed that in preparing paddy land under the puddle system the grubber cannot be employed. The country plough has to be used after the land is once ploughed and cross ploughed with the improved plough.

combined. Five tines with sharp points are fastened to a rectangular piece of wood in the middle of which is fitted a pole. The implement is known as Fun. This, if found to work well, might be adopted in this Presidency. The regular harrow employed in the West has to perform a number of functions.

A Triangle harrow is made at a small cost in Madras after a design given by Mr. H. E. Sampson, Deputy Director of Agriculture. This harrow breaks up the clods, collects the weeds, pulverizes the soil, and removes the surface crust.

12. There is a simple indigenous harrow, the Guntaka of the Ceded Districts. 'It consists of a log of wood forming the body to which the draught poles are attached at such an angle that they rest easily on the yoke of the cattle employed to draw it, and a cross bar or share of iron fixed parallel to it in such a position that it is forced under the soil as the implement is drawn over the land. This share is 2 or 2½ inches broad and about 3 feet long and has one side or edge partially sharpened and is turned up at either end to allow of its being fitted into the body of the implement through wooden tines.' Besides breaking up small clods, the Guntaka, which may be called 'blade-harrow,' is used for levelling the field, rooting up and clearing the stubble, producing a soil mulch, breaking up the surface crust and for covering the seed sown in drills. By working the Guntaka, with a small plank attached to it, hollows in fields could be filled up from the earth scraped off from the adjoining mounds. Harrowing is also given by the implement about three days after sowing to encourage the sprouting of the seed. In fact, the ryot of the Ceded Districts mainly depends, for his tillage operations, on the Guntaka, which is doubtless an invaluable instrument. It is now doing good work on the Government Farm at Koilpatti, Tinnevely District. Regard being had to its utility and cheapness, the implement ought to be introduced in all parts of the country where it is unknown,

13. Similarly a light wooden roller might, with advantage, be introduced for breaking clods and smoothing the surface for providing seed bed. Levelling boards are used for the purpose in this Presidency. But a roller is considered preferable. It is also of use for giving a compactness to soil that is loose in its texture and thereby enabling it to retain moisture for a longer period. The roller, the double mould-board plough* so useful for ridging or hilling, and a few other implements might be owned by a number of ryots in common to be utilized when occasion requires.

14. The land having been reduced to a fine condition by the various tillage operations, becomes fitted to receive the seed. The Indian farmer knows generally the value of good tilth, but he does not realise its full effect, nor does he understand the several objects which are fulfilled by proper cultivation. The objects of cultivation, as given by the late Mr. N. G. Mukerji in his valuable book on *Indian Agriculture*, are :—

'(1) to allow roots to penetrate easily into the soil ; (2) to allow air and water to find easy access into roots and the soil ; (3) to allow absorption of moisture and of gases by soil to take place easily ; (4) to allow the microbes which help in the formation of nitrates to thrive more freely with free access of oxygen and nitrogen, and (5) to facilitate weathering of particles of soil chiefly by the action of oxygen, carbonic acid and water. Nests of parasites are also broken up and disturbed by cultivation. In fact cultivation helps to bring about a mechanical, chemical and biological change in the character of the soil.'

15. Every one of these objects deserves to be viewed from a number of standpoints in relation to important purposes in agriculture. In a well-drained and well-tilled soil the depth in which roots of plants can grow is increased to a maximum ; and in proportion to the fineness of the particles is obtained additional surface or space for the spread and development of the roots. From Mr. Fletcher's

* The double mould-board plough could be used for digging shallow trenches and for ridging or hilling. It is easily worked with ordinary bulls, and the labour saved by the use of the implement more than compensates its cost.

work on soils we learn that 'the particles of soil containing plant food are not themselves sucked up by the plants as was at one time supposed. What the rootlets feed on is the film water which surrounds and slowly dissolves the soil grains; and this film water which is the direct supply of the plants is to be found to a small extent even in soils apparently quite dry. It is therefore of sufficient importance that the particles of soil must be so finely divided as to pass into solution for assimilation by plants.'*

16. Again fineness of tilth and looseness of the soil particles are needed to allow air to have access to the roots of plants. Plants require air as much as they require water; and while the soil and the atmosphere are the primary sources of plant food, about 90 per cent. of the substance of the crops taken from the field comes from the atmosphere, the soil contributing only 10 per cent. Air then is the great source of fertility. From the air there are taken oxygen, hydrogen, nitrogen and carbonic acid. Hence it was that a New England farmer is reported to have exclaimed, 'it is mighty lucky that the supply of these plant foods is inexhaustible.' Another great function of the air has reference to the conversion of the insoluble nitrogen in the soil into available plant food. Humus or decayed organic matter is the chief source of nitrogen in the soil; but it has to be acted on by the oxygen of the air before the nitrogen can be made to assume a form in which it can be taken up by plants. The air enclosed in the pores of the soil is poorer in oxygen than ordinary air, and hence the need for the supply of fresh air to the roots of plants. It may also be observed that even when no crop is grown and the land is allowed to lie fallow, the supply of fresh air let in by the frequent stirring of the soil serves to transform the soil nitrogen into available nitrate for assimilation by the succeeding crop. These considerations, however important,

* It is found that in some soils there are as many as four hundred million particles to the ounce.

do not weigh with the Indian farmer because he is completely ignorant of them, but they are by themselves sufficient to emphasize the value of air as an agent in producing plant food and the necessity for thorough tilth.

17. There is yet another phenomenon which the science of agriculture has placed before us, which brings into still greater prominence the utility of the atmosphere. It is the assimilation by plants of the free nitrogen of the atmosphere by the aid of soil bacteria which attach themselves to leguminous plants. The full significance and value of this phenomenon will be referred to later on. But it is necessary here to note that this assimilation cannot take place unless there is an abundant supply of assimilation air which permeates through the whole field on and below the surface. 'It is the air in the interstices of the soil particles that supplies the nitrogen which these bacteria take in and build up into nitrogenous compounds'; and the greater the tilth and the looseness of the soil particles, the greater is the supply of air coming in contact with the roots.*

18. As regards the effect of good tillage on the capacity of the soil to absorb and retain water and moisture from the atmosphere, very little need be said. It is an established fact that a soil having its particles finely divided and loosened has this capacity to a far greater extent than a soil the cultivation of which has been indifferent. It might here be mentioned that both for the conversion of the humus into available plant food and for the assimilation of the free nitrogen of the atmosphere through soil bacteria, moisture is, like air, an essential requisite.

19. Moisture being also otherwise required for the growth of crops, it is well that we consider what measures can be adopted to secure it. This is a matter of special

* We might perhaps mention here another use of air. Air being a bad conductor of heat, a well tilled soil through which it is allowed to flow does not get so readily heated as a soil not so tilled. This is sometimes not an unimportant consideration in a tropical climate,

urgency in regard to the raising of crops on dry lands dependent upon precarious local rainfall.

The advice that can be safely followed for storing and retaining moisture is to till the land deep, not to *plough* it deep, but only to till and stir it as deep as possible. Deep *ploughing*, that is, the turning over of a furrow or inverting the soil to any great depth, is not recommended except in special cases, for a hot country like India. Apart from its turning up and bringing to the surface inferior subsoil, deep ploughing is by some experts considered undesirable for this climate unless it is had under very favourable conditions. But deep *cultivation* or stirring of the soil to any considerable depth results generally in much benefit. This is effected 'by a country plough being passed behind an improved plough having a mould-board, the country plough on the rear stirring the soil of the furrow made by the front plough.' For the country plough may also be substituted for this work any improved plough without the the mould-board and fitted with a somewhat narrow plough share. When the rains come in downpours, as they do in this country (though the total rainfall for the year may not be much), a soil so stirred and loosened would allow the rainwater to sink into a great depth and be retained instead of soaking merely the surface soil for two or three inches and then running off. The moisture retained in the subsoil rises up to the roots by capillary attraction, while some roots themselves penetrate deep enough and find the moisture. Plants are therefore able to resist drought better when there is deep cultivation than they could otherwise do.*

20. Another means of conserving moisture is by forming a *mulch* or blanket of loose earth on the surface, which prevents the soil moisture from passing into the

* Another advantage of deep cultivation is that a portion of the humus is carried down from the upper layer of the soil to feed the deeper roots,

atmosphere. 'The upper two or three inches of the surface soil can be stirred and reduced to a fine powder called *mulch*, which protects the moisture below from being evaporated.' A compact subsoil readily transmits the water upwards to the surface soil in the same manner that a lamp wick carries the oil to the flame. When arrived at the surface the water evaporates and is lost. This process is incessantly going on under a hot sun and the land soon becomes completely dry. This ascent or upward motion of the subsoil water is owing to capillary attraction, the spaces amongst the particles of a compact soil serving as so many irregular capillary tubes. This phenomenon is not understood by our Indian farmers, nor is any remedy consciously applied by them. By cultivating the soil to a depth of two or three inches the particles are loosened and separated from one another and the capillary interstices are broken up. The capillarity being thus destroyed, the water ceases to rise and remains conserved for the use of plants. A harrow, preferably the blade harrow or Guntaka of the Ceded Districts, could be advantageously employed in loosening the surface earth and forming a soil mulch. When the soil has been properly ploughed, this harrow ought to be used after each shower of rain though the sowing time may not come on at once. Harrowing and pulverizing the soil so as to form a dust blanket will have to be repeated at intervals. For even though no rain may fall, the surface may become re-compacted and it must then be re-pulverized. By this practice which is systematically followed by the farmers of arid and semi-arid regions of America, the soil could receive the full benefit of all the rainfall, and water could be kept stored in the soil as in a reservoir, but placed beyond the influence of the tropical sun. This practice ought to be regularly adopted by our farmers. When crops are on the land the moisture is conserved by inter-culture with the implements called Dantulus which are in fact tiny Guntakas used in the Telugu districts. These Dantulus, two or three of which are

attached to a common yoke, are worked between the rows of plants grown in drills.*

21. The next matter that ought to engage our attention as bearing on the question of moisture, is the supply of humus to the soil. Humus, which is decayed organic matter, has its origin in the dead roots and leaves of a previous vegetation or in a previous manuring with organic materials. The greater the amount of humus in a soil, the greater is its capacity for retaining water. While a sandy soil takes up one-quarter of its weight of water, and an ordinary agricultural soil one-half of its weight, humus retains one and a half times its weight of water. Similarly, in regard to the loss of moisture by evaporation, 'sandy soil loses it most rapidly, clay less rapidly, and humus soil least rapidly.' Besides its utility in conserving moisture, humus is of great service to the farmer in various other ways. It binds a sandy soil that is loose, while when applied to stiff clay it makes the soil more open and friable and easy to work, as it prevents compaction. A soil that is subject to cracks under the heat of the sun is less liable to be so if supplied with humus. But the highest use of humus consists in the supply of plant food.† Of all the elements of plant food, nitrogen, phosphoric acid, potash and lime, nitrogen is the most costly and is also the one element that is liable to be easily lost. And although we get a small quantity of it from the rainfall‡ in the shape of

* For inter-culture on red soil lands it may be desirable to substitute two or three duck-footed iron coulters for the blade-like share of the Dantulu. In regard to garden crops, cultivation or inter-culture ought to follow and not precede each irrigation. By this means the number of waterings required could be reduced.

† 'Carbonic acid is given off abundantly in the fermentation of organic matter and assists in the disintegration of the soil and in rendering available the plant food contained in it.'

‡ It is found by experiment that in the rain water and dew in India the quantity of nitrogen is no greater than what is obtained similarly in England and in temperate climates.

In view to secure the greatest quantity of water and nitrogen of the rainfall it is desirable to have our dry lands divided into smaller fields than at present.

ammonia and nitric acid, nitrogen is obtained by the soil substantially from humus, which also furnishes some amount of phosphoric acid and potash. The nitrogen of humus, though insoluble in water and not available for plants, is by the action of certain soil bacteria, converted into calcium nitrate which is soluble in water and can be utilized by plants.

The presence of oxygen and calcium carbonate is considered necessary for the bacteria to work ; and moisture and a medium temperature are also required. The oxygen is provided by the air which, as already stated, is let into the soil by the particles being loosened and a fine tilth being produced by proper tillage. The farmer must see also to the other conditions as far as possible. Humus is considered so important that intelligent farmers call a soil 'rich or poor' according to the quantity present of this constituent.'

22. Indian soils are deficient in humus or organic matter, and the question is how to supply them with a sufficiency of this material. Humus in the soil is increased by the use of well-prepared farm yard manure and by a systematic rotation of crops, including in the rotation such crops as produce a large quantity of foliage. Dhal or tur, for instance is well adapted as a rotation crop for our dry lands as it is not only a renovating crop, but also provides the soil with an amount of leaf manure. Besides, its roots penetrate pretty deep and open up the subsoil, allowing air and water to enter.

23. Again, the farmer must be able to procure from elsewhere leaves of plants and trees in sufficient quantity to apply to his lands. Providing the lands with this form of organic matter is known as green manuring. The ryots of this part of the country generally supply their paddy fields with this manure, travelling often sixty to one hundred miles to obtain it. But green manuring garden lands and dry lands which most require it, is almost unknown.*

* In Godavari, however, sunn-hemp is grown as manure for sugar-cane.

Manure in the form of organic matter is supplied also by growing leguminous plants on the fields themselves and ploughing them in before they fully mature and begin to bear fruit. Besides furnishing a large amount of vegetable matter which decomposes and becomes humus, the legumes provide the soil with nitrogen taken from the atmosphere with the aid of soil bacteria. The process is thus described.

'The root hairs of a young leguminous plant, destitute as yet of nodules, pushing themselves everywhere into the water-filled crevices of the soil, come in contact with bacteria or their spores. The bacteria then enter into the root hairs, passing from cell to cell in the tissues of the root, where they multiply rapidly, all the time absorbing nitrogen from the atmosphere contained in the interstices of the soil. After a time the plant absorbs the substance of the bacterial cells.' The nitrogen thus stored in the plant is eventually converted in the soil into nitrate in which form it is taken up by the succeeding crop. In some of the Northern and Southern districts of this Presidency as well as in South Canara there is the practice of growing pulses, sunn-hemp or other leguminous crop as a catch crop on paddy lands. These crops are grown for green manuring after paddy is harvested. Similarly, wild indigo (kolinji) and other legumes which require a longer period are grown on wet lands on which only a single crop of paddy is raised. Dhaincha which is grown in Bengal is considered to be a superior legume having an abundance of root nodules and growing 12 feet high in four months. These legumes as well as Bengal bean, cowpea, horse gram and the like might be grown and applied on dry lands and garden lands as green manure as it is done in the United States and other countries. While our ordinary farm yard manure (even in the form in which it is generally made in this country) has become so costly and difficult to procure, we should consider ourselves fortunate in being able to a considerable extent to supply the plant foods by means of this green manure ; and every intelligent farmer ought to

avail himself of all means to provide this manure for his fields, wet or dry. It is considered a good plan to manure the land on which a leguminous crop has to be grown with phosphoric acid, potash and lime.* These induce the crop to grow luxuriantly and supply abundant foliage, while the lime is also useful in converting the nitrogen eventually into calcium nitrate. All legumes do not belong to the same class or variety, and a soil on which one variety of legumes attains a good growth may not be suited for another variety. We have then to take it that the kind of bacteria needed to assist in the growth of the latter variety of legume do not exist in the soil. In such cases a farmer who wishes to grow a particular species of legume must take some earth from a field on which that species was recently growing and distribute it on his own land.†

24. In applying leguminous plants to dry lands and garden lands as manure, a farmer might prefer plants like cowpea, horse gram and wild indigo, which easily decompose and become readily assimilable. On paddy lands, plants and leaves easily decompose in the irrigation water; but decomposition is slow on dry fields.

Our climate being hot and the rainfall scanty, it is better that the plants are chopped off or cut into small

* Humus so valuable for soil moisture and plant food is subject to easy destruction, and under dry conditions it is rapidly destroyed, being burnt out by the combined action of sun and air. Hence the urgent necessity for renewing it by green manure, &c.

Green manure nitrifies more or less rapidly according to the nature of the soil. 'In sandy soils, it nitrifies more quickly than manures like dried blood, bone-dust, &c., and only less slowly than ammonium sulphate; while in stiff clay soils, the green crop nitrifies very much more rapidly than either sulphate of ammonia or animal manures.'

† The earth or soil taken must be from a depth of 1 to 3 inches as the bacteria are in the layer of the arable soil. The soil ought to be well pulverized and the seed moistened and mixed with the soil and sown. Care must be taken not to employ soil from a field contaminated by fungoid disease or insect pests.

pieces and allowed to decay in pits before being applied to dry lands.*

25. In addition to the accumulation of organic matter and nitrogen there are other advantages associated with the cultivation of green manure. 'The temperature of the soil is kept more uniform during the damp and dry seasons. The loss of plant food by percolating water and drainage is considerably reduced. The force of the rain is naturally broken and the amount of wash minimised. Lastly, green manure, if successfully cultivated, will help to keep the weeds in check, a fact of great importance to the farmer.' It may also be added that humus supplied by green manuring has a powerful solvent effect on the potash and phosphoric acid in the soil. This solvent action is especially effective on the phosphoric acid, soils rich in humus having several times the amount of soluble phosphoric acid which is found in soils poor in humus.' Rock phosphate if powdered and applied to a soil containing humus soon becomes available for plants.

26. Of the legumes grown in other countries, velvet bean and alfalfa might be cultivated here. A variety known as Turkistan alfalfa is said to be adapted to hot climates. It sends its roots more than fifteen feet deep,

* According to some farmers it is desirable to dry the plants for a few days and then bury them in the soil instead of burying them while fresh. Every farmer of dry land and garden land ought to have two or more pits into which plants, leaves and refuse of all kinds should be thrown. Over each thick layer of plants and leaves might be spread a thin layer of ashes (preferably fresh ashes), the potash and lime in which would hasten decomposition besides serving as plant food. Employing ashes for this purpose is by some considered better than using lime, which, however, is recommended by many. There might also be a thin layer of earth placed over the ashes. Water must be poured over the materials, from time to time, to keep up moisture. This may be done by making a hole into the interior and pouring the liquid in. 'The covering with earth absorbs the ammonia which is evolved in the process of fermentation and by the action of the lime. After a few months the whole heap should be well forked over and another layer of lime and of earth should be added.'

requires no surface moisture and is able successfully to resist drought. For its utility as forage and as nitrogen producer, alfalfa is described by an American writer as an extraordinary plant for producing wealth and doing wonders to farms.

27. Many of the farmers of Western countries instead of ploughing in the leguminous plants, prefer to give them to their live stock and apply the stable manure to their lands. It would not be advisable for our ryots to adopt this practice. Their houses are away from their lands, and under present conditions, it is very likely that the lands will not receive the benefit of the manure when once the plants are removed from the farm.

28. Landholders owning extensive dry lands ought to set apart some acres for cultivating green manure. There are leguminous plants like Kolinji (wild indigo) and Avarai (*cassia auriculata*) which do not require much moisture and can be grown at a small cost. Cattle and sheep do not touch them. There are again trees belonging to the order of *leguminosae* such as the Punga, the Vagai, the Erthrina and the tulip whose leaves form good manure. They ought to be planted in large numbers.* Most of the ryots have no facilities for growing manurial shrubs or trees. But this is a matter in which our Government could help them through the Forest Department. There are Reserve forests on the hills and in the plains, and trees and manurial shrubs of the kind above mentioned could be grown without difficulty. They would require no labour after planting, and the ryots could obtain sufficient leaf manure for a nominal fee. The Government have generously granted remission of water-tax in regard to water used for growing manurial plants, and we may hope that

* The trees can be planted from cuttings and the seeds of Kolinji, Avarai and the like have only to be dibbled in small holes or pits every two or three feet.

they would be pleased to give their help also in this direction.*

29. From green manuring we pass on to manuring in general. On this subject a few remarks may be offered. In countries advanced in agriculture farm yard manure which is a complete general manure containing nitrogen phosphoric acid, potash and lime, is made in the farm itself on the box system. Under this system of collecting manure, which is adopted also in the several Government farms in this country, both cattle dung and urine are carefully preserved. But the ryots here do nothing to collect and preserve the urine which, though the more valuable element, is allowed to run to waste. Some of our farmers take objection to the box system as, under it, the cattle have to lie on their droppings notwithstanding litter is spread over the same. They think that owing to too much heat, fermentation, and other causes, the system would prove unwholesome to the cattle in this climate. But there are other methods of collecting and preserving the urine which could be adopted; and when manuring has become expensive it behoves every farmer to conserve all his manure in the best way he can. Again there is the waste of valuable manure in the burning of cattle dung for fuel. By burning the dung we lose two-thirds of its manurial value, while as regards the nitrogen contained in it more than 90 per cent. is entirely lost. It would, however, be futile merely to condemn this practice so long as no measures are adopted

* In some of the arid and semi-arid regions of America and Australia, the question of conserving moisture is considered more important than that of manuring; and accordingly every effort is made by farmers to supply humus to the soil by green manuring and otherwise in view to the conservation of soil moisture. Humus is found to be of great value in rendering the soil less liable to suffer from drought; and besides, the humus of arid tracts is richer in nitrogen than that of the moist regions. By growing leguminous crops for supplying humus, 120 to 140 pounds of nitrogen, equivalent to more than 1,000 pounds of nitrate of soda, are produced per acre in the United States.

Production of nitric acid from the atmosphere by electrical means may for the present be kept out of consideration.

to cheapen wood fuel. This is a matter for the consideration of Government, while it must also be said that our large landed proprietors would do well to allot portions of their estates for regularly growing fuel trees with benefit to themselves and to their country.

30. Another important matter regarding farmyard manure has reference to its management and treatment. In this connection we have to acquaint our farmers with a few facts. Organic nitrogen existing in the farmyard manure being in that form unavailable for plants has to undergo the process of nitrification. For this purpose the manure must be kept moist and well aerated and supplied with earth containing lime as a constituent. The nitrifying bacteria would then be at work and the nitrogen of the urine and the vegetable matter in the manure heap would become converted into ammonia and into calcium nitrate. In this process the nitrifying bacteria would also multiply. But there are also denitrifying bacteria so called 'because they take nitrates and ammonium salts and set free the nitrogen, rendering it useless as plant food. These denitrifying bacteria only work in the absence of oxygen.' The farmer must therefore see that the manure heap is not so kept as to exclude all air but kept in such a way that the whole heap may be aerated and supplied with oxygen. It is also necessary that the manure should be kept in a covered place. Otherwise the sun would dry it up and the rain would carry away the soluble salts of nitrogen and potash. The manure heap must not be allowed to become too hot. The practice of our ryots of watering the heap occasionally is good as otherwise the ammonia would be lost. Frequent sprinkling of gypsum or kainit over the manure heap prevents the loss of ammonia.

31. As a general manure sheep folding is given to lands. In tracts in which cattle are available in large numbers cattle folding is also had. Farmers assist each other with their cattle for this purpose. It is advisable that each farmer should tether his own cattle for a great

part of the year on portions of lands lying temporarily fallow instead of keeping them at the cattle-shed close to his residence. In this way many lands might become enriched successively in course of time. Cattle are thus tethered for manuring cocoanut gardens in Ceylon.

32. In oil cakes we have a general manure in a concentrated form, 100 lbs. of cakes contain 5 to 6 per cent. of nitrogen, 2 to 3 per cent. of phosphoric acid and $1\frac{1}{4}$ lbs. of potash; oil cakes are twelve times richer than cow-dung in nitrogen, eight times richer in phosphoric acid and three times richer in potash. Our farmers appreciate the value of oil cakes which are now more extensively utilized than before for manuring wet and garden lands. Some oil cakes like rape cake, etc., take time for decomposition in the soil and they must be slightly fermented in the compost bed before their application.* Regard being had to its cost and manurial value, oil cake is cheaper than saltpetre; and as an artificial manure supplying nitrogen it is considered more economical to use oil cakes than even sulphate of ammonia. In view to secure a sufficient supply of this manure for our lands and from the point of view also of industrial development, it is necessary that the number of

* As in the case of leguminous plants, it is better in this country to apply the oil cakes direct to the land as manure than feed animals with them, as all the dung and the urine do not reach the field. 'Oil cakes produced in the country *ghani* act very quickly, whereas those produced in hydraulic press mills from seed treated by super-heated steam act very slowly. This superiority is due to the fact that the nitrogenous portion of the seed becomes coagulated by heat and therefore can only be utilized in the soils slowly for plant nutrition.'

Farmers buying oil cakes ought to know that the percentage of nitrogen in castor cakes varies with the variety. Pure white cake of Mysore contains 7 to $7\frac{1}{2}$ per cent., while samples from the West Coast of Madras, though pure, contain only $4\frac{1}{2}$ per cent. nitrogen. Samples containing least nitrogen also contain the least phosphoric acid. So also there is great difference due to variety in Ippc (*Bassia latifolia*) as regards nitrogen, while there is not much variation in respect of neem cake and honge cake. In some parts of the country safflower cake furnishes the nitrogen cheaper than other oil cakes.

oil presses of different kinds should be indefinitely multiplied in the country. We may look to the Department of Industries newly created for help in this direction.

33. Bone dust or bone meal, though often used for providing phosphoric acid, is also a general manure furnishing nitrogen and lime in addition to phosphoric acid, while super-phosphate, *i.e.*, bone treated with sulphuric acid, is a special manure. There are also other general manures, tank silt being one of them. Indian soils are not fertile except in rare instances, but are wanting in organic matter, nitrogen and phosphoric acid. For creating and maintaining fertility, it is desirable to apply the general manures in conjunction with proper tillage rather than have recourse to artificial or special manures. The latter manures doubtless 'supply in a small compass the necessary nitrogen, phosphoric acid and potash, which crops require and which farm-yard manure supplies only in small proportions; but they do not improve the physical condition of the soil.' On the other hand many fertilisers are supposed 'to leave the land comparatively poor after a crop is raised by their application.' But farm-yard manure has [a chemical and a mechanical action and is more lasting in its effects. Farmers adopting advanced agricultural methods employ fertilizers not to supplant general manures, but merely to supplement them.

The fertilizers have their own use and advantage, but we have to try and ascertain how far they are suited to the circumstances of this country and to what lands they may be profitably applied. For instance, nitrate of potash though valuable in itself will do little good unless there is a copious irrigation. In regard to dry lands, whose cultivation it is that we ought really to improve, application of artificial fertilizers is attended with heavy risks. Many parts of this country have a scanty and precarious rainfall unlike the European and American countries where such manures are used; and he certainly would be too bold a man who would make a venture with these expensive manures on

the faith of getting a sufficient and timely rainfall. The expenses of cultivation alone would wreck many a farmer should a single crop happen to fail.

Hence, when we have to provide a dry land with phosphatic manure, we ought to apply bone dust or bone meal rather than the costly but quickly acting superphosphate.* Regard being had to the high value of oil cakes and bones as manures, it is desirable that the Government should, in the interests of agriculture, adopt measures to prevent or restrict their export from this country after making any enquiry that may be considered necessary.

34. For supplying plants with potash we need not go in for kainit and other strassfurt salts. Potash manure can be supplied, as is generally done, by the ashes of cattle dung, plants,† leaves and twigs of trees, etc.; but to have proper effect the ashes (including wood ashes) ought to be preserved under a covered roof and not exposed to the weather. Potash also makes the nitrogen of the soil available for plants. It is not generally known that the alkalinity of the ashes of twigs, leaves and cattle dung, serves to rot and decompose organic matter.

35. Lime serves but slightly as a plant food, but it makes potash and other ingredients readily available. Besides being needed for the formation of nitrates in the soil, lime assists in the decomposition of humus and green manure. It acts also as a corrective when a soil is sour and suffers from acidity. Our farmers do not seem to be

* Phosphatic nodules found in Trichinopoly might be ground and applied. It is desirable that its action is definitely tested in our agricultural stations.

† Sun-flower stalks, pea and bean stalks, maize and juar stalks, tobacco stalks, sugar-cane refuse, plantain and other tender leaves, are rich in potash. Fine dark silt, wool and hair also contain potash. Potassium nitrate (saltpetre) and cattle urine are the best potash manures ordinarily available. By folding sheep we supply potash manure as well as nitrogen and phosphoric acid.

aware of these and other* uses of lime. Its application, however, has to be made with caution and under proper guidance. It is not generally advisable to apply lime to rice fields. Nitrification or formation of nitrates does not go on under water and the rice plants take in nitrogen as ammonia. By the presence of lime the ammonia would be prevented from being incorporated into the soil and would be altogether lost. For this reason some farmers recommend the use of ashes in preference to lime for growing leguminous crops on paddy lands for manure. Even for decomposing organic matter lime is not so effective when the decomposing materials are submerged in water. Again in applying lime we have to take care to see in what form it is to be applied whether as burnt lime or quick lime or as carbonate of lime or lime stone (powdered).

36. The use of gypsum for manure is unknown to our farmers though the substance occurs in its natural state in this Presidency and elsewhere in the country. We find gypsum recommended specially for leguminous crops, tobacco and potato, and in connection with the reclamation of Usar lands. Gypsum also acts to some extent as an antiseptic. Having regard to its utility for reclaiming Usar soils the Government ought to take steps to place gypsum within the reach of the ryots at a moderate cost.

37. Expert opinion in regard to manures is 'that general manures (like cow dung, oil cakes, green manure, &c.) are safe to recommend and can safely be tried. They contain their plant food in an insoluble state which is converted into a soluble state. They supply nitrogen, phosphoric acid, potash and lime to the soil, and have the great advantage that they will supply organic matter which is wanting

* It might be mentioned that lime in the form of carbonate of lime may be applied to sandy soils to bind their particles together so as to increase their absorptive power. Lime has also the power of lessening the puddling tendency of a clayey soil. This it does by coagulating the finely divided clayey particles. The particles becoming coarser the land can be worked without difficulty.

in most Indian soils. It would seem therefore superfluous to add that cowdung should receive every possible care, and that the urine which contains the soluble nitrogen and potash should be carefully mixed with the excreta and stored.' 'In cowdung we have a well-balanced manure as all the plant constituents would be taken up under a proper system of rotation. In a costly manure like saltpetre the proportion of nitrogen to potash is unbalanced and no plants could take up 40 per cent. of potash to every 13 per cent. of nitrogen.'

38. As a guide in the application of manures chemical analysis will be of some help as it will show roughly in what ingredients the soil is wanting and what ingredients are removed by a particular crop. But the only certain guide is obtained by practical experience in the field itself. While nearly all Indian soils will be benefited by organic or nitrogenous manures, a clayey soil is considered to have sufficient potash for ordinary plant requirements. Sandy soils generally will improve chemically as well as mechanically by potassic manure and lime. As regards crops, leguminous crops require abundance of potash and lime while cereals like paddy, wheat, barley, &c., require a supply of nitrogen and phosphoric acid to attain their maximum growth.

There is a number of substances for supplying nitrogen, phosphoric acid, potash, etc.; and one rule deserving our attention in the application of manures is not to use the same manures each year, but to employ alternately manures of different kinds providing the required plant foods, so that one manure 'may correct the defects of another.' Again, out of different forms of manures, especially fertilizers, supplying the same ingredients, one form is to be preferred to another, regard being had to the particular crop. For instance, though potash and nitrogen are needed for tobacco, potash ought to be supplied in the form of sulphate of potash and not in the shape of muriate of potash or kainit, for these latter contain also chlorine

which will affect the quality of the tobacco leaf while they may be applied to the cotton crop with advantage; sulphate of potash is considered the best form also for sugar-cane. Similarly, for supplying nitrogen for tobacco, we are advised to prefer nitrate of soda to sulphate of ammonia though both are nitrogenous manures. In general manures too, it is found that the nitrogen in the form of oil cakes is more available and acts more quickly than that in farmyard manure.

Again certain manures, though useful by themselves when independently employed, ought not to be mixed or applied to the soil about the same time lest they neutralize the effect. Lime ought not to be applied along with farmyard manure; nor sulphate of ammonia along with lime or basic slag. One other matter to be borne in mind in reference to artificial manures is that some of them ought not to be directly applied to certain kinds of crops but only indirectly, that is, applied to a proceeding crop. Potato, which requires a large supply of potash, is stated to respond best to potash applied to a proceeding crop 'which converts potash salts into organic compounds.'

A caution that is enjoined in regard to special or artificial manures is that when such manures are applied to an irrigated crop, particular care ought to be taken in the irrigation which will have to be done as an art. We must give just sufficient water and no more.

40. Before quitting the subject of manures, we ought to bear in mind the remarks of Mr. Fletcher in relation to fertilizers or special manures. He observes: 'the modern soil doctor prescribes for the land less medicine and more attention to exercise and general condition. It is, he contends, not fertilizers, but tillage, rotation of crops and addition of humus in the form of farmyard manure and ploughing in green crops which unhealthy soil needs in order to regain its vigour.'*

* It has also to be noted that if it is desired to use concentrated fertilizers, such as superphosphate, potash and ammonium salts, these can

41. In connection with the question of manures there is a problem of great interest to the farmers of this tropical climate. It is whether and how far manures affect the total quantity of water or moisture required for a crop, (*i. e.*) whether by supplying abundant plant food by fertilizers we could reduce the total amount of moisture ordinarily required for maturing the crop. It is a fact that potash increases the water-holding capacity of soils; and as already observed the application of humus or green manure helps to retain moisture. What is now claimed as the result of certain experiments in England is that fertilizers are of considerable assistance in combating drought.* It is highly necessary that the Agricultural Departments of the different provinces should take up this question and have experiments conducted in the various Agricultural stations.

42. We now pass on to sowing and the growth of crops. Sowing of seed is generally done either broad-cast or in drills. In the Telugu Districts of this Presidency and in Mysore almost all dry crops are sown in drills with the aid of an implement called the Gorru. 'It consists, like

be mixed with advantage with bulky compost manure, before being applied to the land. Used in this way they will be in less danger of leaching away, and will be of greater benefit than if applied directly to the land.'

* Messrs. Lawes and Gilbert have established the fact that for every gram of organic matter elaborated 250 to 300 times as much water had been transpired, but that when the land was rich in plant food, after having been well manured, for example, a relatively smaller amount of water was taken up and given off by the plant. Therefore, fertilizers not only supply the plant with the necessary food, but lessen the relative amount of water transpired, and one of the chief uses of transpiration is to obtain for the plant the necessary plant food. For forming 1 lb of dry matter in a hot climate 500 to 600 lbs. of water are considered to be needed by the soil. Some agriculturists are of opinion 'that in a hot climate like India the dominant factor being the water-holding capacity of the soil, the effects of bulky manures in modifying the texture and improving the mechanical condition of the soil may outweigh considerations based on the supply of plant food only.'

The effect of silt in the improvement of soils is considered to be a mechanical rather than a purely chemical one.

the Guntaka, of a log or transverse beam forming the body to which two carrying shafts are fixed as draught poles, but carries, on its lower side, three, four or six miniature native ploughs which form seed coulters or tines. These tines are fitted into the transverse beam at equal intervals and are pierced to allow the passage of seed into the furrows they form.

There are hollow bamboo tubes drawn through the seed coulters and united at the top by a bowl or hopper which they support. The hopper and tubes are bound to the Gorru by an ingenious arrangement of strings. As the implement is drawn by bulls, the seed is put into the hopper from which it passes into the bamboo tubes and is dropped into the furrow. This is a cheap and simple instrument. With the three-rowed drill about 3 to 4 acres may be sown in a day, and double that extent with the six-rowed. It is said that perhaps there is no part of the world where sowing is more effectively carried out in a skilful manner than it is with these drills in the hands of a careful ryot. The seed is covered by the Guntaka which follows the seed drill. The Guntaka is also worked three or four days after sowing to give what may be called 'sprout harrowing' which prevents the surface soil 'setting' and thereby hindering the germination of the crop. One advantage of sowing in drills is the saving of seed ; but what is of far greater importance is the facility afforded for weeding and ærating the soil. By sowing in drills interculture can be done for a long time even after the plants come up. The implements known as dhantulus are used for these purposes in the Ceded Districts, and bullock-hoes, cultivators or grubbers can be equally employed and worked by bulls. By the use of these implements the plants are earthed when necessary and the whole field is stirred and ærated and moisture conserved in the soil. The great object secured by interculture is the retention of moisture in the soil. As already observed moisture is more important in a hot climate than even manure, and when once the crop is on the ground the

moisture can be conserved only by frequent interculture of the soil between the rows of plants, sown in drills. By this means a soil mulch or dust blanket is formed to a depth of about two inches and it effectually prevents the evaporation of the soil moisture which is made available for the plants for a long period. This soil mulch acts also like a sponge which absorbs the dew and other moisture from the air, besides taking in rain water. Interculture also provides the conditions favourable for the development of nitrifying bacteria so beneficial for the maintenance of soil fertility : (*vide* also the remarks in para 20 above).

43. But the seed-drill and the implements associated with it have not been known to the people of the Tamil Districts. The ryots of the Telugu Districts have always been in advance as regards dry cultivation. It is only recently that the seed-drill and other implements are beginning to be introduced in the Southern Districts of the Presidency. The Department of Agriculture in this Presidency, besides adopting this mode of sowing, &c., at the Government farm at Koilpatti, has been getting some of the ryots in different parts to have their cotton lands sown in drills. In several centres in the Tinnevely District respectable landholders who are themselves agriculturists, had portions of their lands sown in drills in the last sowing season. The sowing and other operations were conducted under the supervision of the officers of the Agricultural Department. The lands so sown compare very favourably with adjoining fields sown and cultivated in the ordinary way, and the contrast is the more striking by reason of the unfavourable season we have had. In some places the seed sown in drills germinated and the plants came up, while in the neighbouring fields sown about the same time in the usual method the seed did not germinate. In almost all the centres the effect of interculture upon the plants is distinctly discernible.

The ryots readily appreciate the advantages of this method which in a few years will come to be in general use.

It is hoped that the Department will continue this work which is calculated to confer a great benefit on the agricultural population. The various Agricultural Associations ought to have as one of their chief functions, the holding of demonstrations in their respective districts with the improved plough, the seed-drill, the dhantulu or bullock hoe, and other improved agricultural implements. The implements are not costly and the adoption of these methods of cultivation would not only result in an immense saving of time, labour and money, but would, to a considerable extent, also lessen the risk of a failure of crop.

44. Of the crops grown in this Presidency, paddy occupies the foremost place. It is cultivated with great care both on the dry and the puddle systems. The fields are given six or seven ploughings and well manured with cattle dung, ashes, nightsoil, tannery refuse, tank silt, oil cakes leaf manure, etc. Green manure is grown on the fields themselves only in some parts, and where it is not so grown, it is purchased and carted from long distances. Sheep folding is common. The use of fish for manure is not generally known, but it is just being introduced. Fish manure contains both nitrogen and phosphoric acid. On the dry system, seed is generally sown broadcast and not in drills. In some cases seven or eight grains are dibbled together in furrows every seven or eight inches. On the puddle, paddy is sown broadcast, or seedlings are raised on nursery beds and transplanted, the latter being the method generally adopted. Seedlings are transplanted in bunches, each bunch consisting of 10 or 12 seedlings and planted 6 or 7 inches apart. There is also the practice of double transplantation to be met with here and there in certain parts. In this method seedlings are raised in the ordinary way and transplanted first in a field in small bunches after the lapse of about a month. They are there allowed to grow for another month or six weeks and again transplanted in a third field with single seedlings. This method is adopted only in regard to the varieties which take a long

period to mature. The yield is heavier than in the case of the ordinary transplantation provided the fields are well manured.

45. But the transplanting of paddy with single seedlings at the outset is now coming into vogue. At first, trials were made with the variety known as Banku paddy, but it has been found that many other varieties planted with single seedlings tilled well enough, and this method of planting is being made popular by the Agricultural Department and several Agricultural Associations. Under this method a fourth or fifth of the quantity of seed ordinarily required is enough for raising seedlings. Only the seed ought not to be crowded into too small a space. Besides the saving in the seed, which itself is an important consideration, the ears of corn are more uniform than in the crop grown in the ordinary way, and the yield also is satisfactory. Again by the adoption of this method a great impetus will be given to improvement by seed selection as we have only to pick up a number of the best ear heads to give us the small amount of seed needed at the start. It would be a great advance in paddy cultivation if this practice of planting single seedlings should become sufficiently general.

46. Another desirable improvement is the sowing of the seed in drills wherever paddy has to be sown in preference to transplantation. In America, transplantation is costly and paddy is always sown in drills. Drill sowing is adopted in some of the Government Farms in Bengal and also in some parts of Chingleput District.

47. But what is more needed for this part of the country with scanty and irregular rainfall, is a paddy which will send its roots deep into the soil and resist drought. Almost all the varieties grown here are aquatic in their habits and are surface feeders. In the same way that there are peculiar varieties of paddy, like the *Kolaivalai*, that continue to grow though the crop is wholly or almost wholly submerged in water, a variety may be discovered, if sought for, which could thrive with but a little more

water than is needed for ordinary dry crops. Already we have some varieties, like the Banku of Northern India and the Pulithi-peratti of these parts, which are supposed to require less water than other kinds of paddy. By seed selection and breeding and by carrying on the cultivation with special methods and under special conditions it may not be difficult to produce a variety that we want. In the case of wheat, for instance, a variety known as the Macaroni or Durum wheat has been developed in the United States by seed selection and breeding so as to be drought-resistant, and the result is that wheat is now grown in localities and climates where it was not possible before to cultivate the crop. Again, by seed selection and breeding the protein content of wheat has been increased. And there is no reason why a variety of rice cannot be evolved with a much greater protein content than the ordinary rice.*

This work of seed selection and breeding is not such as can be undertaken by our farmers. It can be done only under the supervision of experts. Having regard to the importance of rice as a food stuff in this country, the Agricultural Department should carry on experiments in different Agricultural stations. Seed selection and breeding may be made also in view to develop other characteristics in a variety, such as prolificness, fineness, suitability for alkaline or saline soils, early maturity, hardness of grain, &c.†

48. There are, however, some matters conducive to the improvement which ought to be carefully and systema-

* One kind of Burmese rice is rich in albuminoids (8.5 per cent.) in oil and in mineral matters, and is considered to be much nearer 'a complete food' than any variety grown in India. The glutinous Japanese rice though containing $1\frac{1}{2}$ to 2 per cent. of oil is comparatively poor in albuminoids.

† The aim of the breeder is the finding of the best plants in the variety with which he is working and the propagation of these plants *under conditions favourable to the fixing of the desired characteristics* so that they will come true to type *under ordinary methods* of cultivation. The securing of reliable seed for planting is with him a necessity,

tically attended to by the farmers themselves. For the purpose of raising seed every farmer should set apart a field (though small) and cultivate it with particular attention. Special care ought to be taken in selecting the seed, as the use of seed of weak vitality would result in a poor or uneven stand and diminished yield. All light seed should be rejected. In transplanting the seedlings raised with the selected seed, weak or diseased seedlings should not be used. Planting should be with single seedlings unless the soil is found to be not favourable for tillering. Again the seed grown on one field should not be used continuously on the same field. There ought to be exchange of seed raised under proper conditions in different tracts having a similarity of soil, climate, rainfall, etc. The importance of this, though known to some farmers, is not sufficiently realized.

49. In manuring for paddy, bone meal or bone dust might with advantage be used in many cases. Till now sufficient attention has not been paid to phosphatic manures.*

Bone dust and saltpetre together form a complete manure, the former supplying the phosphoric acid and lime

* The experiments made in manuring paddy lands in some of the Government Farms in Bengal establish the following:—50 maunds (Imperial) of cow dung or 3 maunds of bone dust and 1 maund of saltpetre, produce the same yield. Six or 7 maunds of castor cake or 3 maunds of castor cake with 40 maunds of cow dung, also result in a good crop. While cow dung, bone dust, etc., are applied before the last ploughing, saltpetre is to be given as a top dressing some time after the transplanted seedlings take root and when there is little water allowed to stand on the surface. Where there is much water and free surface drainage, oil cake or dung may be applied in preference to saltpetre.

Again saltpetre should be used on fertile soils only or used in conjunction with a phosphatic manure as it makes the constituents of soil soluble and liable to be washed away. Saltpetre and even oil cakes should be never applied at the time of germination or brought in contact with roots. They are to be mixed up with soil or sprinkled diluted with water, ashes or earth or applied to the soil in between the rows of plants that are afterwards irrigated.

and the latter the nitrogen and potash required by the crop. For some soils potash may have to be supplemented by ashes. The action of bone-meal, though generally slow, is comparatively quick in paddy lands owing to irrigation. Thomas' phosphate, though slightly inferior to bone-meal, is suited to all irrigated soils. Growing a green manure crop such as Dhaincha (of Bengal), sunn-hemp, pea, cow-pea, beans, pulse, etc., and ploughing it in some time before planting the seedlings, form the cheapest system of manuring paddy. In the majority of instances green manure which costs very little to grow gives nearly the same yield as other manures.

On paddy lands on which water is allowed to stand no manure is converted into nitrates or nitric acid, but ammonical compounds are generated from the decaying organic manure and nitrogen is taken in by the plants in the form of ammonia. One early effect of the nitrogen is seen in the branching or tillering of plants. In regard to green manure and other organic manure it is considered advisable to have the same fermented and decomposed in the compost bed before applying to paddy land. If the material should be applied in a fresh or raw state, decomposition would go on in the soil itself and all the available oxygen in the soil would be consumed by the decaying substance in the process of fermentation and decomposition, and in consequence the roots of the transplanted plants which stand so much in need of this grass become injured, turning pale in colour and showing a slow development for over a month. Where decomposition is not effected in a compost bed, the organic manure should be ploughed into the field two or three weeks before transplantation.

50. An average crop of paddy comprising 2676 lbs. of grain, 2676 lb of straw and 446 lbs. of chaff, is said to remove from the soil 20.2 lbs. of nitrogen, 16.3 lbs. of phosphoric acid and 28.1 lbs. of potash, while a good crop comprising 4014 lbs. of grain, 4460 lbs. of straw, and 624 lbs. of chaff is considered to remove 39.2 lbs. of nitrogen, 24.9 lbs. of phosphoric

acid and 45·7 lbs. of potash. The analysis given for a like crop in Italy, shows somewhat higher amounts of plant food removed. In this part of the country a full or 16 anna crop of paddy is represented by* 3600 lbs. of grain, and this is obtained only on good soils and under favourable conditions. The weight of straw which varies from $1\frac{1}{4}$ to $2\frac{1}{2}$ times the yield of grain may be taken to be 5400 or 6000 lbs. For producing such a crop on a fairly good soil we have to provide a manure supplying about 60 lbs. of nitrogen, 30 lbs. of phosphoric acid and 45 to 50 lbs.† of potash. As regards the yield, it would seem that our tropical climate is an advantage. In the Year Book for 1906 of the Department of Agriculture, United States, we read: 'Where the sky is clear, the sun shines intense, and the air dry, if water can be supplied when plants need it, we have ideal conditions; assimilation will go on at its best and the production of organic substance will be all the more favoured. The result will be a large crop of large-sized grain. The temperature of the season affects the quantity and quality, hot seasons producing the most abundant‡ crops.' Where therefore we can have a good

* Even in the United States, Queensland and Italy, where better methods of cultivation are employed, this would be considered a good yield, though some farmers may occasionally obtain as much as 100 bushels (4500 lbs.) of grain per acre. The greater the straw the more it exhausts the soil without paying a sufficient return.

† 100 lbs. of cowdung contain nearly $\frac{1}{2}$ lb. nitrogen, $\frac{1}{3}$ lb. phosphoric acid and $\frac{1}{4}$ lb. potash. In the tract watered by the Tambraparni river which brings down no silt, 12 to 16 cart loads (a cart load weighing 1000 lbs.) of cowdung are generally applied per acre on fairly good soils, while some farmers give in addition sheep folding also to the fields. Where the straw is wholly removed from the field along with the grain, 50 maunds or 4000 lbs. of cowdung (the quantity applied in the Farms in Bengal) would be inadequate for the lands here.

‡ This agrees with the experience here. The Kar or hot weather crop of paddy which matures in four months produces a larger outturn than the Pisanam or cold weather crop though the latter may take five months and more to mature. In England too, it is said that the cold rainy seasons produce a poor crop.

soil and an abundant water supply we ought to be able, by improved cultural methods, to produce even 5000 lbs. and more of grain. We should also see that the full yield of 3600 lbs. becomes more universal than at present.

51. The next matter that demands our attention has reference to the time for harvest. Paddy should be harvested when the straw has barely commenced to yellow. 'If cutting is delayed till the straw shows yellow to the top, the grain is reduced in quality and quantity and the straw itself is less valuable. The Americans cut their paddy crop even when the grain over the lower one-eighth part of the ear is in the milky stage so as to get the maximum produce of the best quality.' 'The Indian ryot generally waits until the whole ear is dead ripe, only cutting the crop about a week earlier when raw rice is wanted than when paddy is intended to be boiled before husking. Few are aware that the ears of paddy, cholam and other cereals mature from top to bottom. The top-most grains in an ear are the earliest to ripen and are the best, and are liable to shed and be lost soon after ripening. By waiting therefore until the whole ear is ripe, we secure only the inferior grain at the bottom of the ear at the expense of the best grain at the top.' The loss in quantity is caused not only by spontaneous shedding but also by shelling out or shattering of the grain in handling the ears of corn. Our ryots ought therefore to follow the example of the Americans: similarly in regard to wheat, it has been observed that the 'best time for harvest is when the grain is of a waxy consistency and can clearly be broken by the finger nail.' 'Shortly before maturity the mother plant ceases to draw any nourishment from the soil and it then becomes the function of the plant to transport the elaborated materials to the head and grain.*' At this time plenty of moisture is needed. The want of it would check the pro-

* Hence it is that the straw cut before grains are formed in the ear heads is relished better than the straw reaped after grain development,

cess of transporting the soluble substances elaborated in the leaves and stems to the grain,' thus resulting in an inferior and reduced crop.

52. In the husking of paddy and preparation of rice for the market, great improvement has to be effected. With the help of scientific methods and improved machines it is possible to reduce the proportions of husks to the grain. In America, during milling, about 1 lb. of husk is removed from 5 lbs. of paddy, whereas in India 2 lbs. of husk are removed from 6 lbs. of paddy. It is also desirable to select and grow the varieties with hard grains which will break little in milling. The Japanese rice is considered good in this respect. The grain produced on old perennial rice fields is less liable to breakage than what is obtained from fresh fields. In fact the percentage of cleaned rice is greatly influenced by the method of cultivation (including seed selection) and subsequent working. The best lots of rice in America give 100 to 112.9 lbs. of milled rice from 162 lbs. of paddy. Again Indian rice in the foreign market fetches from $1\frac{3}{4}$ to 4 shillings per bushel of 45 lbs. while American rice sells $2\frac{1}{2}$ to $4\frac{3}{4}$ shillings per bushel. This higher price for American rice is owing to polishing, which 'gives the grain a kind of pearly lustre.'

In the polishing process, some of the most nutritious portions of the rice grains are taken away. But fashion demands rice having a fine glass and the purchaser pays more for a fine looking but less nutritious article. In considering the improvement to be made in the quality of the grain we should bear in mind that while a bushel of inferior rice may be worth one rupee, the same quantity of superior rice might fetch five rupees. But superior rice costs more to cultivate. Capitalist farmers could make themselves highly useful to themselves and their country, if they would turn their attention to scientific farming on a commercial scale.

53. Paddy cultivation in this Presidency depends upon Irrigation works which are mostly under the control of

grow oats which are said to be fit for harvest between 65 and 75 days.

55. Maize is again another crop which is little grown in this province, but whose cultivation should become largely extended. Good Australian maize is grown by Mr. Abraham Pandithar of Tanjore on a small portion of his farm. Experience in the Cawnpore farm shows the desirability of growing indigenous maize in preference to that of foreign countries. But regard being had to the superiority and high value of Queensland maize, it is perhaps worth while that further experiments should be made to introduce and acclimatize this maize in the different provinces of the country. There are also a few other foreign varieties suited for introduction into this country. In view of the weather conditions of Southern India a variety maturing in less than 4 months has to be preferred. Of the kinds of maize grown in India, Jaunpore maize is considered the best and is highly recommended. South Indian farms ought to take up its cultivation. In America the protein content of maize or Indian corn has been increased by seed selection and breeding.

56. Potato is another crop that ought to be more extensively cultivated than at present in this Presidency. Experience in some of the Government farms in Bengal shows that large profits can be made by its cultivation, and there seem to be no difficulties in the way of raising potato as a cold weather crop in many parts of this Province. Naini Tal and Patna varieties are considered to be the best in this country. A crop raised from entire seeds yields a far greater outturn than that grown from cut pieces. It is not generally known to the farmers of these parts that potato can be grown with much profit. Yam-beans is a new crop which is a leguminosæ producing tuberous roots and long pods.

57. Among other crops too, some varieties grown in certain parts of India are superior to those found in other parts, and the superior varieties ought to be introduced in

localities where they are till now unknown. Kambu or bajra and onion grown in Guzarat and some other parts of Bombay are supposed to be good. It might here be mentioned that a superior variety of kambu, known as the Transvaal kambu, and a superior variety of onion, called Dhulia onions have been successfully grown by the Agricultural Department at the Koilpatti farm, Tinnevely; and these varieties might, with much advantage, be introduced on their own lands by our farmers. Awned kambu should be introduced wherever possible.*

In the matter of oil seeds, Cocanada seeds are supposed to have more oil content than those raised in many parts of Bengal. By way of plants for green manure we may add to our stock by introducing Egyptian clover suited even for alkaline soils, alfalfa, and dhaincha of Bengal.

58. One kind of improvement of crops would be, as already observed, the production of varieties which strike deep roots, withstand drought, resist diseases and insect pests, or are specially prolific. But the chief improvement in regard to the existing crops consists in increasing the protein content of cereals and other food stuffs, the oil content of oil seeds, the sugar content of sugar canes, etc. Beet root as formerly cultivated in Europe contained only a small percentage of sugar, but it now contains three or four times as much. Similarly, the sugar content of the cane can be considerably enhanced by improving the density of the juice and otherwise. 'Though when left to nature, the amount of sugar in a plant is probably a constant factor in its physiological economy, yet we can (by selection and breeding and the adoption of proper methods) improve the sugar-yielding quality, as we make animals improve, by

* The Bengal Agricultural Department recommends :—

- | | |
|-----------------------------|--------------------------|
| (1) Oats—Dumraon Oats. | (6) Mustard—Jubbulpore. |
| (2) Juar—Saran. | (7) Maize—Jaunpur. |
| (3) Arhar—Saran. | (8) Wheat—Mozuffernagar. |
| (4) Grain—Patna. | (9) Jute—Deswal and |
| (5) Paddy—Central Provinces | certain other varieties. |
| Aus. paddy. | |

selection, in any direction we want, and in the particular qualities and capacities which best subserve our own purposes and requirements. The ulterior limit of the process will be reached when the cane is made *a tube of saccharine matter.* The Department of Agriculture has successfully introduced in this province the Mauritius sugar cane, which, though requiring more water than the country canes, is considered a superior variety.

59. But improvements of this kind (which involve not only seed selection, but also hybridization and plant breeding) as well as the introduction of foreign crops and varieties, cannot and ought not to be undertaken by private farmers, but must be left to the expert knowledge and guidance of the Department. It is, however, possible for the majority of the farmers to effect considerable improvement by attention to seed selection and modern cultural methods so far as they can be adapted in the circumstances of this country. Our farmers ought also to take up the cultivation of such new crops and varieties as may have actually been shown to be economically profitable. Already a good beginning has been made by the Department, at the instance of Government in regard to the improvement of cotton. Seed farms for pure indigenous cotton have been established and trained men are asked to visit villages to explain and show to the ryots improved cultural methods, such as sowing in drills, interculture between plants, &c. The ryots understand and appreciate the value of these methods and the prospect of a general improvement is certainly hopeful. Again, as Egyptian cotton has been grown in Sind, American cotton (probably Upland), and Cambodia cotton are finding favour with the ryots in some parts of this Presidency. Superior cotton does not require what is known as black cotton soil. It can be grown on any fairly good land provided the crop is sown early so as to receive the benefit of the rainy season and arrangement is made for giving, if necessary, two or three waterings before the pick-

ing. There are many tracts suited for the cultivation of such cotton in rotation with ground-nut, dholl and other crops, and the cultivation of the superior varieties of cotton will soon be largely extended. It need hardly be observed that the production of superior grades of cotton in the country will advance its industrial position immensely.

60. Coming to the fibre crops other than cotton, we find jute almost monopolising Bengal. There is expert opinion that it can be grown in many parts of this Presidency which command facilities of irrigation. In some parts of Bengal a crop of jute and another crop of paddy are taken from the same land in one year, and the value of the jute adds much to the profit. But where jute cannot be grown with success, *Pulichhi* (Gogu or ambari fibre of the Northern parts) known to commerce as Bimlipatam jute or Deccan or Bombay hemp, can be cultivated with profit. At present the Deccan hemp is grown only here and there amidst other crops with a view to supply sufficient fibre for the farmers. But as there appears to be a rising demand for the article, for ropes, cordage, canvas, etc., and as the fibre itself is considered superior to jute and more durable, our farmers ought to be made acquainted with the value of the crop, so that it may be regularly cultivated by itself like any other crop. The seed must be sown sufficiently thick, as otherwise the plants would throw out branches and would not grow straight for purposes of fibre. It is not known what value can be got for the seeds for obtaining oil. There is again the sunn hemp (called also Jubbulpore hemp) grown to some extent in certain parts of this Presidency. This is considered superior even to the Deccan hemp and can, if properly prepared, be expected to fetch a good price, both in this country and in Europe. The fibre is made to serve a variety of purposes. Its cultivation does not involve much labour or expense (though the cost of the seed is rather heavy), and if the rains fail, the crop requires but a few waterings at long intervals. Another advantage is that sunn hemp is a leguminous restorative crop which

takes in nitrogen from the atmosphere by means of the bacteria of the root-nodules. Besides, owing to the hardy nature of the plant and rapid growth, the crop can be cultivated even on land infested with weeds which are soon held in check and finally destroyed. With so many points in its favour the cultivation of sunn hemp for purposes of fibre ought to become much more extended than it is found to be, and the farmers in all localities which can command clear water (in tanks, ponds, etc.) required for retting, should direct their attention to this valuable crop. We may pass over fibre plants like the agave or sisal hemp, the rhea, etc.; for, though they may produce good fibre, the ryots have to wait some years before a crop is obtained; and besides, these plants could be grown with profit only by large proprietors who can raise them on an extensive scale and put up the machinery needed for the extraction of fibre.*

61. We may pass over pulses, root crops, etc., merely observing that ground nut has become an important crop in this Presidency and that the Department might try the introduction of soy beans, acclimatized German peas and any other pulse known to possess superior qualities. Tapioca or cassava is a root-crop, whose cultivation on a decent scale might be made to support an industry. Similarly bananas or plantains might be raised on large and numerous fields in view to the manufacture of banana meal. Both tapioca and banana are, to some extent, grown in Travancore, but no industry seems to have been organized on the basis of either crop.

62. With regard to crops like tobacco, experts ought to be engaged on contract for teaching, explaining, and working out the various improved processes of cultivation

* Two other fibre plants deserve notice. One is the *Sida rhombifolia* or *Sida*, supposed to be a high class fibre, far superior to jute and ranking nearer to flax and rhea; and the other is Rajmahal hemp which is even superior to rhea and the finest hemp, in strength and durability. These, however, have not yet been tried on a large scale,

and manufacture. In the United States a variety has been so improved as to yield a large produce of cigar wrappers. It would not be difficult to find some places here suited to the growth of superior grades of tobacco.

63. Fodder crops occupy an important place in the economy of good husbandry. There are, however, no good fodder crops well suited to the circumstances of this country. We want nutritious fodders which can grow in this climate and be drought-resistant. Repeated attempts were made to introduce exotic grasses which are supposed to be drought-resisting in the country of their birth ; but none of the trials proved successful. Even *Paspalum dilatatum*, a drought-resisting grass which was highly spoken of some years ago, did not succeed in the plains of India without irrigation and when irrigation was given it 'did not yield such a large return as some other grasses, native or introduced.' A new fodder grass considered valuable has been recently brought to notice in other countries under the name of African Wonder grass (*Panicum Spectabile*). It may be tested by the Department and then introduced into this country. Alfalfa or American lucerne might also be introduced. Alfalfa besides 'being a soil improver of the highest merit serves as a flesh-forming feed for growing livestock, and as a milk and egg producer, it is unexcelled by any plant of large production. It grows $2\frac{1}{2}$ tons of hay per acre on an average, or twice the average for all kinds of hay. Alfalfa hay is more nutritious than other hays.' The Department of Agriculture in America has produced a variety of Alfalfa suited for hot climates and the Department here would be doing a good service by getting this forage plant in our midst, acclimatizing it, if necessary. Alfalfa is said to send its roots 12 to 15 feet deep and there is no reason why it should not thrive in this country drawing the requisite moisture from the lower strata of the soil. Alfalfa may be given to cattle mixed with straw or other fodder. It may be cut or ground when dry. If necessary it may be steeped

in hot water. *Reana luxurians* or buffalo grass, though a heavy yielder, cannot withstand a drought. Guinea grass and the different kinds of cholam (sorghum) supply sufficient good fodder when properly cultivated and irrigated. But irrigating a fodder crop is not found economical and we require a plant which can grow and thrive without artificial irrigation.

The hariali grass common in this Presidency is a hardy plant, and the Kolcuttai grass of Coimbatore is also supposed to be of value. Ramna grass grown near Mysore is said to withstand drought. The Sundhia of Guzerat (a kind of sorghum) is stated to be a fodder of special value. The stalks are thin from the root upwards and there is no wastage in feeding. Cattle and horses are said to be fond of it. Johnson grass (*sorghum halepense*) is a drought-resisting fodder plant, but being a troublesome weed with a tremendous root system it ought to be confined to poor soils near which there is no cultivation. Farmers should see that a portion of the crops grown for fodder is of the leguminous kind such as the sunn hemp, cowpea, horse gram, &c. Leguminous crops not only benefit the land on which they are grown but supply more nutriment to the cattle than cereal straw or grasses; and in feeding cattle 'three parts of the fodder ought to consist of graminaceous kinds and one part of leguminous kinds.' Every farmer should regularly cultivate a small portion of his land with fodder. This practice is followed to some extent in black soil tracts where no waste lands exist for pasturage and no hills or forests are available for grazing purposes in the neighbourhood. The cholam (juar) fodder is a nourishing food both for milk cows and draught animals. Fodder plants should be cut only after flowering; otherwise albuminoids would not have been formed. 'Hariali like most other meadow grasses must be cut immediately the flower begins to appear; in this state the juices of the grass are more nutritious and the hay is far superior than when made from the fully matured plant. Besides, when

cut before the seed appears, the plant is more vigorous and produces another crop much sooner.' The best way to preserve fodder is by drying it properly, and in the case of grass, making it into hay. Emmer is a grain said to be well adapted as a stock food and suited to dry land areas. 'Golden Beauty' maize is a heavy yielder of early fodder under irrigation. It is grown on the Cawnpore farm. In tracts favourably situated cattle are allowed to graze in Government forests; but the Government should consider whether more liberal rules cannot be framed and the existing rules more liberally worked, providing greater facilities to the ryots without any real injury to the forests. The ryots feel that there is too much solicitude on the part of the Forest Department for making revenue and maintaining a rigour not required for efficient management.

64. We now come to rotation of crops. Rotation of crops is to a considerable extent practised, though not systematically, by Indian farmers. Nothing is more common, for instance, than for a ryot to grow Kambu (bajra or spiked millet), Bengal gram or coriander, on dry lands cultivated with cotton the previous year; while Kambu makes no great demand upon the soil for plant food, the two others are restorative crops for land on which cotton was grown before. Prior to the introduction of synthetic dyes, indigo crops used to be raised in many places, especially in the districts of Cudapah and South Arcot, in rotation with paddy. A number of ryots would join together and put up vats in various centres amidst the paddy fields grown with indigo. After extracting the dye the indigo refuse formed the most valuable manure for the succeeding paddy crop. But indigo has now become unprofitable and it is not easy to find a substitute. The principles of rotation not being understood by our ryots the practice is not so universal or methodical as it ought to be. Rotation of crops is a succession of crops, one following another, on the same land, the order of succession being regulated with some aim or object in view.

Different crops carry away different quantities of fertilizing elements from the soil, some removing more nitrogen and some more phosphoric acid or potash than others. If the same crops are grown on a piece of land for a number of years they will remove the same fertilizing elements which thereby will soon be reduced to below a limit where crops can be grown with profit. This evil is avoided by diversifying the crops grown in different years. While some crops are exhausting some others are not so, while others again are actually restorative besides yielding a profit. Ground nut and Bengal gram and certain other leguminous crops have this quality. 'The main aim of rotation is to grow in succession different varieties of crops interspersed with crops rich in root-nodules.' For another reason also the same crops ought not to be continued notwithstanding the proper application of manures. It is found that the excreta of one plant though deleterious to the growth of the same kind of plant are not necessarily injurious to another kind, and 'that different species of plants themselves aid in the destruction and removal of deleterious organic substances.' In Bengal 'jute following jute on the same land is found to yield a poorer result than when an intermediate crop of rice is taken.' Rotation of crops must be so arranged that a succeeding crop may utilize the manure ingredients not assimilated by the preceding crop. So also a crop with a different root-system and feeding on the lower layers of the soil may be made to follow a crop which is a surface feeder. Again, the continuous cultivation of a crop like cotton destroys the humus of the soil though manures may be applied, and it is desirable to raise crops so as to conserve humus. For instance, a crop of *Dholl* (*arhar*) which is a leguminous crop would provide the soil with a large amount of foliage. Besides, continuous raising of the same crops favours the growth of bad weeds and insect pests and as a protection against these, diversity of crops is essential. On these and other considerations crop rotation is one of the most important factors in farm management,

65. As regards paddy, want of rotation does not seem to be injurious. The crop is not so exhausting as wheat or maize. Nevertheless, it is desirable to have a suitable rotation apart from growing legumes as a catch crop. In Italy rotation is attended with increase in yield, but it is doubtful whether the method followed in that country, including the laying out of lands as meadows, is adapted to Southern India. In Bengal paddy is rotated with jute and potato. Jute may be tried in Southern India ; but potato cannot be grown on paddy fields which have too much moisture for the crop. The same difficulty may exist for cultivating ground nut on paddy fields unless it should be grown in the hot weather under well irrigation. Turmeric and plantains are grown in some places on high level paddy lands.* Having regard to the difficulties found in introducing a satisfactory rotation for paddy lands, the Agricultural Department is expected to take up the question. It is also desirable that the Department should find out by experiment about half a dozen methods of rotation for dry and garden crops suited to different localities in each province. It may however be observed that the practice or method of rotation followed in some tracts seems to be good and well suited. The practice of growing mixed crops is prevalent in this province as in other parts of India.†

66. *Irrigation of crops.* Irrigation is by itself a wide subject and it is not intended here even shortly to deal with it. The attention of farmers is invited to but a few points touching the distribution of water. Lands watered by lift irrigation are divided into beds of small or large dimensions and irrigation is generally given by spreading the water over the surface of the beds. The disadvantages of this

* It is invariably the practice in some places to grow sunn hemp after turmeric as paddy will not grow on the land on which a turmeric crop has been taken unless a sunn hemp crop is made to intervene.

† In some parts having an uncertain rainfall, cotton or Dhol is sown early on high level paddy lands. If the monsoon should prove deficient these crops continue. But if the rains are normal and irrigation tanks fill, the crops are ploughed under as green manure and paddy is planted.

method of irrigation are these. 'Besides the destruction of the tilth and the formation of a surface skin which becomes hard and impervious on drying, this method leads to a great loss of water by evaporation. Moreover, in many cases, percolation is slow as the air in the soil can only escape very slowly laterally. Further, flooding the surface often leads to an infertile condition of the soil, due possibly to the partial destruction of the bacterial flora thereof.' To overcome these disadvantages, what is called 'furrow irrigation' must be adopted. It is in use in the cultivation of a few crops but is not generally practised as our ryots have not understood the principles and realized the advantages. After the land is properly tilled and manured, furrows about 3 or 4 inches deep, and wide or narrow as the case may be, are laid off at the proper distance, and seeds are sown or seedlings planted either on the tops or on the sides of the intervening ridges, according to the season, nature of the soil and the like. The water let in into the furrows percolates laterally and the intervening soil containing the plants is sufficiently moistened. 'By filling the furrows with water several times the soil between becomes so well moistened that transplanting of plants is carried out in the soil moistened by lateral seepage.' Ordinarily, filling the furrows once gives the whole soil the requisite moisture, and the loss of water by evaporation is minimised. 'Taking the quantity of water evaporated under surface flooding as a basis, applying water in shallow furrows was found to make a saving of 13 per cent., while applying deep furrows brought about a saving of 25 per cent. The drawbacks of this method are that the land cannot be watered so rapidly as by other methods, and porous soils are hard to wet uniformly throughout the furrows.' Nevertheless, furrow irrigation is best for the irrigation of orchards and cultivated crops. There is little displacement of the top soil and the surface soil is not soaked and does not tend to bake or become too hard to cultivate. Excessive irrigation injures the quality

of certain grains, such as wheat, making them too soft and mealy. As regards trees there is no use of irrigating near the trunk. 'It is not the large roots but the ends of the young roots that take in the water while the larger and thicker roots merely carry the water after it has been taken into the plants by the smaller rootlets. Irrigation water as well as manure should therefore be applied, not at the trunk of the tree but under the outer branches where the feeding roots are found.' The following instructions are given for watering fruit trees. Make the watering channel with a mammotie, in the form of a circle round the tree under the outer branches. After each irrigation, as soon as the soil in the channel is dry enough, loosen the surface of the channel with a mammotie to prevent the rapid evaporation of the water which has been applied. In this connection it may be observed that besides assisting ryots with loans for making wells for irrigation, the Government ought to provide at least two or three sets of boring tools for each district together with the establishment for having them worked. A nominal fee might be levied for the use of the tools for trial borings, &c. The Government have procured a few sets for the whole Presidency and it is hoped that they will soon provide the ryots of each district with facilities for extending the well-irrigation area.

In every system of farm management, fallow has an important place. Land exhausted regains fertility by rest. This is *bare fallow* by which is meant 'an interval between the crops upon a soil, during which space of time no crop is grown upon the land. It is a *period of rest*. But fallowing to be really beneficial requires the land to be well stirred. For the soil consists of earthy particles that are slowly soluble, and as time passes, the water and air together cause these to decay, and let loose the fertility they have held locked up.' This method is considered aboriginal, and exhaustion is better prevented by having some kind of vegetable growth on the land. Again bare fallow is said to be thoroughly successful only in a dry climate

‘in which case the active production of nitrates, which takes place in a fallow, furnishes the plant food for the succeeding crop.’ It must be borne in mind that the activity of the nitrate-forming bacteria depends on the cultivation and tilth constantly given to the fallow land. Bare fallow is known to be injurious in a wet climate as it causes a rapid diminution of soil nitrogen which gets out of the land by wash and drainage. In an experiment it was found that about two and a half times as much nitrogen was washed out from a bare soil, as from a soil upon which a wheat crop was grown. By drainage, there is no appreciable loss in phosphoric acid or potash. These elements when applied become incorporated with the soil and are there firmly held subject to gradual dissolution for the benefit of succeeding crops. But nitrogen, which is the most costly element, is liable to be easily lost. Hence, farmers have recourse to ‘fallow crops’ and ‘catch crops’ to prevent the loss of nitrogen. Besides, nitrification is active when some crop is on the land rather than when the land is fallow. In parts of this province catch crops are grown more to obtain some profit than with a view to add fertility to the soil, though of course the soil is to some extent benefited. But there are many farmers who cultivate fallow crops (leguminous) on purpose in order to improve their lands. In this hot climate there is one great objection to leave our lands bare fallow in summer. The exposure of the soil for a long period to the fierce rays of the sun burns up and destroys the organic matter in the soil, which becoming devoid of humus, loses its fertility as well as its water-holding capacity. It is therefore a better practice to raise some leguminous crop, whether on dry land or wet land, during the so-called period of rest or fallow, and convert the same into green manure before the plants become hard and woody. But where the conditions for any such crop do not exist and the land has to be quite vacant for a number of months, it ought not to be allowed to lie loosely as it is left by the plough. It ought to be

levelled and made somewhat compact, while about two or three inches of the surface soil ought to be frequently stirred with cultivators or country ploughs so as to form a dust mulch. A harrow would be a useful instrument for this purpose. The effect of such treatment would be to receive and retain moisture, keep nitrification active and minimize the loss by destruction of organic matter by the heat of the sun. An objection is sometimes raised to the growth of vegetation on fallow land on the ground that it robs the soil of all moisture. It is, doubtless, a fact that a field bearing a crop gives up more moisture than it would if left in bare fallow and that (even in a cold climate) 250 to 300 lbs. of water are transpired or evaporated from the leaves for 1 lb. of dry matter added to the plant. But, the objection has no force in this country as we are not in a position to utilize for the future main crop or for other purposes the moisture taken up by the fallow or catch crops. We have, however, to bear in mind the above truths in our endeavours to clear the weeds which rob the moisture required by the crop and dry the soils.*

68. In the light of what has already been said, it is almost unnecessary to speak separately of the improvement of soils. Our farmers know how to improve their lands, by warping, mixing of soils, &c. Clayey adhesive soil is mechanically improved by the use of sand, especially of sea sand which renders it more pervious to the admission of air and water, while a sandy soil is greatly benefited by large quantities of tank silt. The ryots adopt these measures of improvement but they do not seem to be aware

* Notwithstanding the advantages above mentioned in connection with the raising of catch crops, some landholders owning double crop paddy lands would not cultivate catch crops (even legumes) if they intend the lands to be cultivated on the puddle system for the next crop. They do not plough the lands after harvest but leave them bare for about three months (March to May) to be acted upon by the summer sun and wind. This action of the sun and wind is believed to temper or mellow the soil in some way not understood. The result is found to be good. These lands are manured with green leaves and cattle dung.

that stiff clayey soil is rendered porous and friable and a sandy soil firm and compact by the application of leaf manure. Green manure plants may be grown and applied if there is sufficient moisture, or withered leaves may be collected and allowed to rot in pits and then applied. The leaf manure improves also the hygroscopic property of the soil which absorbs moisture from the atmosphere in the same way as common salt and jaggery exposed during a night imbibe the atmospheric moisture and are found wet in the morning. It has already been pointed out that the capacity to conserve and retain soil moisture is very much enhanced by the leaf manure and that this is a consideration of great importance in a tropical climate. Besides, the fertility of the soil can be maintained only by vegetable or organic matter being applied. For it is this vegetable matter or humus that has to supply the soil nitrogen which is to feed the crops. Dr. Voelcker and other experts seem to insist upon the supply of this substance as a condition for the maintenance of fertility, and recommend the growing of leguminous plants for providing it. Another essential for fertility is to apply manures (cattle dung and other manures) somewhat in excess of the crop requirements. And under proper cultivation, drainage where needed, suitable crop adaptations, crop rotations and judicious use of manures (general and special), the fertility of lands cannot only be maintained but can be largely increased. Where a soil is so exhausted as to be wanting in the ability to digest and absorb any restorative application, it would be unwise to use fertilizers. In such cases thorough draining, persistent deep tillage and irrigation may be tried. Various measures have been recommended for improving *usar* and other lands requiring to be reclaimed. It is not proposed to notice them here.* But one effective remedy discovered some years ago for *usar* land is the application

* Reference may be made to Dr. Voelcker's report, Mr. Mukerji's Handbook on Indian Agriculture and Agricultural Ledger No. 13 of 1901 and other Ledgers on the subject.

of gypsum. This material is now too costly. Gypsum is said to be found in large quantities in the salt range of Northern India and is also available in the Trichinopoly, Chingleput and Nellore districts of this Presidency, and Government should arrange to have gypsum sold at a small price for purposes of agriculture.

69. No method of agriculture can be complete or effective without due provision being made for combating plant diseases and insect pests. Every agriculturist knows how immense is the loss occasioned on this account ; and yet it is here that the Indian farmer finds himself helpless. Information on this subject ought to be widely disseminated by leaflets in the vernaculars and lecturing tours arranged to acquaint the royts with the habits and mode of life of injurious insects and the means to get rid of them. It would appear that there are not even a few men now available for the purpose, and the sooner a sufficient number of men is trained in this branch of agricultural science the better it would be for the country. Apart from specific remedies for particular diseases and insects, there are measures generally applicable to most cases. In the first place sufficient care ought to be taken in the selection of good plumpy seed of proper vitality and free from disease and contamination. To prevent smut, the seed of some grains such as juar, maize and wheat is treated with sulphate of copper before sowing. If the soil be stirred, as it can be by interculture, even after the plants come up, many insects may be destroyed by birds. Some creeping insects are destroyed by falling into small trenches made for the purpose, while many winged ones plunge themselves into the flames when bright lights are burnt at night near the fields. Fire traps are also put up on farms with this object. Farmers are advised to seek out and destroy the eggs of insects wherever possible. Spraying the plant with lead arseniate or other like solution is an effective remedy against many pests. Very often the insects themselves can be hand-picked and destroyed, as is

the case with the red bug of cotton. When a plant becomes withered while the crop is on the land, whether it be sugar-cane, cotton, brinjal or other crop, the withered plant must be removed and *burnt*. In the case of cotton all bolls (whether mature are not), which are diseased or attacked by worms must be taken off and *burnt*. After harvest or packing, the stubble, stalks, leaves, &c., of all the plants of a crop must be destroyed by fire in cases of suspicion of disease or insect pest. Some farmers grow a trap crop to prevent injury to the main crop. For instance, maize is grown as a trap crop amidst sugar-cane, and as the mothborer and other caterpillars are fond of maize and settle on that crop, the cane is free from attack. The maize plants are then cut in about six weeks after they are first attacked, and burnt. If, however, the plants are but slightly affected they are given to cattle. In some countries agriculturists introduce birds, lady-birds and parasites inimical to insects. This can be done here only by the Department. For some time to come the Department should also provide our farmers, on payment of cost, with solutions, washes, &c., for the destruction of insects as well as with the appliances for using the same. Rotation of crops is also one remedy for plant diseases and insects. While one crop may support a species of insects another crop may not be serviceable as food and the species will be starved to death. Our ryots may hope to have the insect enemies fairly in check if they would but carefully carry out the suggestions above mentioned. It is found that exotic crops, like the Mauritius sugar-cane, Egyptian or American cotton, &c., bring with them new diseases, and our farmers ought to take care that they do not get any foreign seed unless under the advice and guidance of the Department.

70. It will be observed that in what has gone before, no reference has been made to the question of drainage. This is partly because drainage, though forming part of good husbandry, is not so important in this country as it is in wet climates, and partly because it is understood and

practised to the extent needed here. Air cannot permeate a soil which is waterlogged and plants cannot have a healthy growth. 'Ill-drained lands are always cold and work badly under the plough.' Drainage is resorted to also to get rid of the injurious salts from *usar* lands. This would, however, require an abundant water supply. While our farmers effect surface drainage with success they do not practise subsoil drainage unless in rare cases and with the aid of open trenches. 'But in flat-lying fields and tenacious soils where the ground water moves sluggishly, deep under-drainage (preferably tile) is required. The primary object of deep drainage is to permit both soil and subsoil to crumble and disintegrate, and through the mechanical and chemical changes thereby induced, to become friable and susceptible of retaining the right amount of moisture for plant growth; the secondary effects are reduction of surface run off and checking of erosion'. Subsoil drainage is too costly. Surface drainage is sufficient for all practical purposes as regards our paddy lands.

71. Agriculture is stated to be conducted in Japan on the most economical methods. In most parts of the country no cattle are employed. Instead of ploughing, farmers get their lands dug, and the tillage is said to be almost perfect. There is no farmyard or cattle manure considered essential by farmers in all other parts of the world, but night soil is carefully collected and prepared into manure. Each farmer has a compost heap. Fish is also used as manure and is said to be imported from India among other countries. As Kolinji or pulse is sown in this part of the country, the seeds of a leguminous plant are sown before paddy is harvested and a catch crop is obtained. The amount and distribution of rainfall and other climatic conditions being also favourable, the Japanese reap a good harvest. It appears that the Japanese Government have been greatly assisting the people in their progress in agriculture. In the opinion of those who have visited Japan and observed its agricultural methods, our farmers ought to imitate in certain practices

their Eastern brethren. We cannot get on here without ploughing bulls and other draught animals. But we might follow them in respect of deep cultivation and perfect tillage, methods of interculture and manurial practices. If there is a country in which no material is allowed to go to waste it is Japan. Every detail of farming is carefully attended to. There is no slovenly cultivation, no carelessly worked areas, all seems on a general level of excellence and is like one vast well-worked garden.

72. But the highest profits in agriculture are made by the farmers in America. Besides possessing a fertile soil the country commands abundant rainfall which is also properly distributed. The other climatic and natural conditions are also favourable for the production of a crop. But what are of equal, if not of greater importance, are 'the good business methods of the farmers, their application of the teachings of science in crop production and in the care and management of stock.' Hence it is that they are the most prosperous of the farmers in the world. But there are some arid regions in Western America in which the climatic conditions are adverse though the soil is very fertile. Sometimes the winds blow as hot as from a furnace and the annual rainfall varies from 12 to 15 inches. In this region trees are reared and fairly good crops of wheat are produced. Some other crops are also raised. What is stated to have been achieved is so striking and wonderful, that 'it would be incredible if it were not true.'

73. But all this is due to the intelligence, ingenuity and perseverance of some of the American farmers who have discovered or devised a method of culture known as dry farming. There is nothing quite new in the principles but their application is so novel and effective as to make the method appear a new invention or discovery. The object of the farmer is to conserve so much moisture (of the rainfall) in the soil as will of itself suffice to support a crop throughout its course and until its maturity. For this purpose the soil has to be kept in such a condition that it

will be able to store as large a proportion of the rains as possible. Hence ploughing should be done not only as early as possible after the harvest but should also be deep enough to afford a reservoir to receive the rains. The land ploughed is not allowed to lie loose lest the moisture be lost. It is immediately harrowed with the ordinary harrow or with a disk harrow. Sometimes an implement called sub-surface packer is employed. What is required is, that the lower soil should be compacted and the surface left in a well-tilled and loose condition to prevent evaporation. Every time there is rainfall the surface will get encrusted and the crust must be removed by working a light harrow. The seed is sown in drills and the harrow similarly worked until the plants are three or four inches high. On account of the fine tilth produced and the systematic performance of the above operations, farmers are able to conserve moisture for nearly two years, so that the moisture obtained from rainfall in one year will be conserved and utilized for a crop to be sown in the succeeding year. There is a kind of dry farming practised in the Ceded Districts of this Presidency. The Guntaka or blade harrow used for keeping the surface soil in a powdery state and the Dhantulus employed in interculture between the crops, serve to conserve the soil moisture.

74. The farms of intelligent farmers who have business habits are managed on sound economical principles. 'On a certain farm consisting of 15 acres near Pennsylvania, 13 acres are cultivated, the remainder being occupied by buildings, yards, &c. This farm came into the possession of the present owner with a mortgage of 7200 dollars upon it. For the first year the farm lacked 46 dollars for expenses. During the next six years the mortgage was paid off. The soil is a reddish, somewhat gravelly clay. The present fertility of the farm is due solely to the use of stable manure produced on the spot. The system of handling manure is such that not a pound is lost, either liquid or solid. No commercial fertilizers have been used. In

this farm systematic management is the most pronounced feature. Each of the principal operations is performed on a fixed day each succeeding year or as near to it as weather will permit.'

75. We have roughly gone over most of the salient points of improved farming as applicable to the circumstances of this country. In some instances, details which might ordinarily be omitted have been mentioned in view to make the position clear and definite. It only remains to refer to a few matters regarding the improvement of agriculture by educating the ryot population and acquainting them with improved cultural methods, &c. As already pointed out, the ryots will do well to employ the improved* plough to give the first two ploughings for their lands. They may then use the grubber or cultivator or plough with the country plough for giving fine tilth. Though deep *ploughing* is not often needed, *stirring* of the soil to some depth is necessary to enable it to receive a large portion of rainfall. It is desirable to enclose our lands with fences as far as possible, but what is absolutely needed is that all the lands, especially dry lands, should be divided into small plots (but of convenient extent for ploughing) and bunded with small embankments, about a foot high all round, so that rain water is not allowed to escape but made wholly to sink into the soil. Otherwise not only would much moisture be lost but the first rains would carry away fertilizing matter. The harrow should be frequently employed and the tillage operations, referred to under dry farming, should as far as possible be carried out. Special attention is drawn to the fact (already noticed) that a soil whose surface is well pulverized and stirred for a few inches conserves the moisture much better than a more compact one; but this pulverizing of the surface should be done by

* Farmers who have fairly strong bulls might employ a Swedish or an English plough. They might also go in for a turnwrest plough for clearing deep rooted grasses, and for a double mould-board plough which saves much labour in making hills and furrows.

the harrow or other means the same day as the land is ploughed wherever this may be feasible. 'In the case of the soil of good tilth, a few inches of whose surface are stirred up loosely, the openings between the particles are too coarse to allow the moisture to rise freely in these few inches. Also in the large interspaces between these particles a considerable volume of air is trapped and forms a semi-damp, more or less stationary, protective cushion of air between the quickly changing dry atmosphere above, and the point to which the water is comparatively brought up.' One other matter, though already mentioned, requires to be emphasized. It is the application of vegetable matter or humus to lands, especially to dry lands and garden lands. Humus would not only enable the soil to absorb and conserve moisture, but would also supply the crops with plant food and go to build up the permanent fertility of the soil. For this purpose not only should leguminous crops with nodules be raised on the lands themselves, but legumes like Kolinji (*Tephrosia purpurea*) and Avarai (*Cassia Auriculata*) which are hardy, drought-resisting plants, ought to be grown on all waste lands available to a farmer which he cannot profitably cultivate, as well as on tank bunds, banks of nullas, &c. Kolinji though an annual perpetuates itself by the shedding of seed; while Avarai continues to give cuttings of twigs and leaves for many years, sometimes yielding two cuttings in a year. Trees of the leguminous order ought also to be reared in large numbers. Indian soils would bear any amount of humus or leaf manure which in fact is the cheapest manure. There ought to be more care in the collection and management of cattle manure, solid and liquid, and a general compost heap for receiving all vegetable and animal matter ought to be maintained. This is indeed the secret of success with some agriculturists. When concentrated manures are needed, oil cakes and bone in the form of bone-meal will sufficiently answer the purpose. Sowing ought always to be in drills, so that there may be interculture between the

plants till they attain a certain height. By interculture with Dhantulus or other bullock-hoes not only are the weeds cleared but the soil is aerated, nitrification promoted, and above all, moisture conserved. This treatment conduces also to the absorption of atmospheric moisture by the soil. The ryots who understand that weeds interfere with the growth of crops are not aware that they rob the soil also of its moisture. Working with Dhantulus or bullock hoes is also economical. Seed for sowing must be carefully selected at the time of harvest. Our farmers ought to bear in mind that though a foreign variety of crop may be superior, the climatic conditions here may prevent its development. Hence, they should not grow a new crop or variety unless under proper advice and guidance. Even as regards rotation of crops, it is advisable to adopt a system or method which has been tried and has succeeded. It is true that the methods of culture generally adopted here are fairly good and suited to existing conditions; but it is equally true that the agriculture of the country can be indefinitely improved and that unless we adopt prompt measures for improvement we are sure to be left behind. But before any substantial reform can take place, our ryots must be acquainted with the elementary principles of agriculture and must also acquire the business habits of their Western brethren. They must also follow the manurial practices of Japan and imitate the Japanese farmers in their care and attention to details in all agricultural operations. Again, our educated classes ought to take to agriculture. It is then that our farmers will be well informed concerning scientific investigations regarding farming. In conjunction with chemistry and other allied sciences, Agriculture has become a fascinating study; and though in carrying on their experiments the agriculturist and the man of science have to adopt the same or similar methods, the experiments of the ordinary scientist are too often dry, while those of the agriculturist are clothed with a living and practical interest.

For men who try to approach agricultural problems in the proper frame of mind there is enough of intellectual work. Our farmers ought to feel that improved agriculture must be the ground-work for the industries and manufactures to develop, and that the industrial salvation of the country depends upon agricultural advancement. In fact our farmers must have public spirit enough to realize that in trying to advance and improve agriculture, they are really rendering service of the highest kind to their country.

76. While individual farmers can carefully manage their own farms on proper methods and set good examples to their neighbours, there must also be concerted action for the common end. There are good agricultural practices prevailing in one part of the country but are unknown to another. The Agricultural Associations established in various districts ought to get hold of such instances and take measures for the practices being adopted throughout the country. The Associations ought also to have demonstrations given, in their several districts, of the improved agricultural implements which have been tried and found useful, and also by leaflets and otherwise disseminate information regarding new and improved cultural methods. The Associations themselves or some of the members might take up the cultivation of new crops and varieties which may have been tested and shown to be profitable. Again there are many estates under the Court of Wards and most of them can have demonstration farms (though not experimental farms) and seed farms for the growth and distribution of pure seed to ryots. There might also be arrangements on the Estate farms for the breeding of cattle wherever facilities exist. In fact the working of home-farm lands attached to each estate would be an object-lesson for the ryots to learn improved methods. There are some farms opened and worked in this Presidency on the above lines. The Superintendent of the Estate farm at Sivagiri, Tinnevely, has been doing useful service in various directions. Lectures are also given in his tours

through the villages. The farms on the estates under the Court of Wards ought to be some of the media for bringing to the notice of the cultivators 'experimental results of proved value' and introducing them into ordinary farming practice.

77. But the education of the ryot population can be undertaken only by Government. In all rural schools Agriculture ought to have a prominent place, and instruction should be given in the elementary principles of the science, and facilities afforded for learning object-lessons in Agriculture as an art. Many authorities recommend the attachment of a garden to each school. 'In addition to the work of the Colleges and Schools of Agriculture, instruction ought to be provided for the masses of agricultural people who do not attend the schools. Oral instruction in agriculture should be provided in the country parts, itinerant teachers and lecturers being employed.' In Denmark and Sweden numerous special classes for adults are arranged; Demonstration fields exist in large numbers in European countries, France alone having more than 3000. In Java where the conditions are similar to ours, the '*experiment* stations are few and good and a system of travelling farms and gardens has been developed and the work of the stations is thus brought home to the cultivators in every district by actual demonstration.' Our country ought to be provided with a number of trained men to go on lecturing tours with a similar object, they being provided with the necessary equipment. The Department has begun to take action on these lines in respect to the cultivation of cotton. It appears that in the Bombay Presidency there is the method of sending a gang of sugar boilers to different parts to show better methods for preparing *gur* from sugar-cane. A similar course should be adopted here for this and other purposes. In all *experimental* stations, a separate *demonstration* farm ought to be maintained and worked on economic principles, its receipts and charges being kept distinct. This would

avoid misconception on the part of the farmers visiting the station, and they could see that improved farming is really profitable. Otherwise, they would be frightened by the total expenditure for the station relatively to the income. At the colleges or schools to which farms must of course be attached, there ought to be short courses for cultivators and for students (whether holding lands or not) who may be unable to take a degree but who are willing to undergo training for about a year. The training given to the young men in the handling of implements and machinery and in the different processes of improved cultivation cannot but be of use to the country. The various Agricultural Exhibitions and Cattle Shows held from time to time in the country are of use, but lectures and instruction given on the occasion might be better organized than at present. It is desirable that a monthly journal in the vernaculars should be edited under the guidance of the Department, in addition to any journals edited by private agency. Accuracy of information regarding results of successful experiments and details of cultural methods must be maintained. Many Co-operative Credit Societies have been started and are doing good work in the Presidency, and it is likely that credit will be cheapened in the course of some years. One measure which the Government ought to undertake in the interests of Agriculture is the cheapening of fuel. On this question Dr. Voelcker observes: 'I regard the provision of fuel as the most potent means of maintaining prosperity, not alone to the cultivators, but to the State itself, and as a measure which the latter, *in its own interests*, should take up immediately. If wood could be made to take the place of dung for fuel, we should soon come to realize that more wood means more manure, that more manure means more crops, and more crops an increasing revenue to the State; whilst, to the cultivator, it implies more fodder, better cattle, and more manure again to ensure the future fertility of the soil.' It is unnecessary to point out what other great

advantages would accrue by raising plantations of trees wherever this could be done without affecting the subsoil water to the prejudice of well-irrigation in the immediate neighbourhood. It has already been mentioned what help the Government could render in the way of cheapening oilcake and bone manures, and in extending the area of well-irrigation.

Seed farms for cotton, ground-nut, sugarcane, &c., have been started in certain Agricultural stations, but the number of them ought to be greatly multiplied for supplying the ryots with pure seed. The ryots are appreciating the good work, and in this respect and in several others they will have to look up to the Department for many more years for help. Apart from the direct results it produces, the Department will in course of time be a power for good among the people. In the United Provinces, the well-boring work is entrusted to the Agricultural Department, 180 new wells were bored and in 117 existing wells the supply of water was increased; and we have the following report:—‘The success attending these operations has been of the greatest value in inclining the people to rely on the assistance of the Department in Agricultural matters generally. Not alone in questions of water-supply but in other matters, the advice of the Department is freely accepted in many localities where the well-boring work has brought the people into touch with its officers.’ ‘The winning of the confidence of the cultivators is the first condition of success in any improved method. The cultivators must, in fact, feel that they can turn to the Department for further assistance which will be willingly given to them.’ ‘By personal intercourse between officers of the Department and leading cultivators, much can be done to increase their confidence in the Department and their interest in the work of the Stations. Requests for information should in every possible way be encouraged.’ And although the improvement of agriculture depends largely upon the people themselves, it is hoped that, in all the matters above mentioned as well

as in other matters in which it may be necessary, the Government will be liberal in their help for the advancement of the great cause, which is the cause, at the same time, of both the people and the State.

SECOND DAY'S PROCEEDINGS.

The Fourth Indian Industrial Conference assembled again in the Congress Pavilion at 2 P. M. on Sunday, the 27th December 1908.

The PRESIDENT, who was received with cheers, said :— Gentlemen, yesterday a number of papers was laid before the Conference. About 20 papers have been written for us and such of the gentlemen as were present and as were willing to give a purport of what they had written were requested yesterday to give a brief summary of what they had written. They kindly did so and as most of you have heard them, I need not say anything in regard to them. As usual they are full of the most valuable information which will be exceedingly helpful to us in the work we have to carry on with regard to the various industries. They are written by persons who have devoted themselves to the subjects with which they deal. Thus the subject of Co-operative Credit Societies has been dealt with by men like Mr. R. Ramachandra Rao, Mr. Crosthwaite and Mr. Shama Rao. In regard to Central Agricultural Banks, we had a paper from Sir Vithaldas D. Thackersey; in regard to the indebtedness of the Agriculturists we had a paper from our friend Mr. Lalubhai Samaldas. Then we had a paper from a Deputy Director of Agriculture in regard to Agriculture. There is a paper in regard to Agricultural Improvements from Mr. Ramakrishna Iyer; in regard to irrigation pumping we had a paper from Mr. Chatterton. There are all these papers which are of great importance, and as they are now printed, the whole lot will be put together in a handy form and published. I am sure all of you will read them with the care they deserve. Our thanks are due to the gentlemen who have taken the trouble of preparing such valuable papers and on your behalf I shall take upon myself the honour and privilege of communicating your thanks to them. We have also received communications

by means of telegrams and letters from several gentlemen who take great interest in the industrial movement and who had proposed to come but were not able to do so. Among them are Professor Norman S. Rudolph of the Indian Institute of Science, Dr. P. C. Chatterjee and Mr. Saroda Charan Mitter—the last two, as you know, adorned the benches of Lahore Chief Court and the Calcutta High Court respectively.

We shall now commence to-day's business by taking up the resolutions which were prepared by the Subjects Committee which sat the other day. The first resolution will be proposed by our respected leader Mr. D. E. Wacha. (*Cheers.*)

The First Resolution. Departments of Industry.

MR. D. E. WACHA (Bombay), who, on rising, was received with cheers, said:—

Mr. President and Gentlemen,—The Resolution reads thus :—

‘(a) That this Conference is of opinion that there should be in every Province of British India a Department of Industry under a Director of Industries to deal with industrial questions and to be in charge of Technical and Commercial Education as well as Industrial Instruction; and that there should be an Advisory Board of qualified persons, not less than one-half of whom should be non-official Indians, who should be consulted on all matters of importance;

‘(b) That the functions of this Department should include (1) the supply of advice in regard to new industries, (2) the introduction of new or improved methods and processes, (3) the carrying out of investigations and experiments, (4) the development of selected industries, and (5) the organization of Industrial and Commercial Exhibitions;

‘(c) That there should be an industrial museum and a bureau of information under the Department of Industry for supply of information to the public on industrial and commercial matters.’

I may say that this is a very ‘general’ resolution. Practically speaking, I think, you may take it as the creed of the Industrial Conference. It narrates the aims and objects of the Conference. I may say it is a pious declaration of faith as to what we shall do in the future from year to year. We are defining our aims and objects, and

I hope, Mr. President, that this creed of yours will always preface all resolutions of the Conference in the future, so that the younger generation may know exactly what are the purposes of that organisation. With reference to this purpose, I may say in the language of business people, that it is 'a very large order.' It is very good no doubt to say, we shall do this, that and the other thing. It is not, however, such a simple thing as some people, without experience, may imagine. In the first place, let me inform you that this resolution contemplates a very large organisation working from year to year, from week to week, from day to day, in order to realise the objects in view. Secondly, it means, we must have ample sinews of war. Organisation in these modern days cannot be simply built in the air. We must have money, but it must be frankly confessed that in this respect we are very poor. I do not know where we are to find all the money to fulfil our aims and objects. However, as I have said, it is a good beginning, and if we were enthusiastic and earnest we could accomplish a great many things by slow, steady perseverance.

A Director of Industry and a Department of Industry are certainly very necessary. But everything depends upon who the Director is. We have the official Director, who, more or less is an Academic gentleman. He must have the advice of practical people. We do not want a book-worm, however learned. The book-worm may bring his knowledge and the practical man his experience; combined, we may have an efficient Director of Industry. I hope, Sir, that Government which is so alive to the necessity of having a Director of Industry will bear in mind in the selection of such a person the combination of qualifications I have just mentioned.

Next, the duty of this Director will be to deal with the Industrial questions as they arise and to be in charge of Technical and Commercial education as well as Industrial instruction. These are undoubtedly wide duties, indeed—

but I shall not of course take up your time on this occasion by dilating on them at length. Let me however say one word about Commercial education. It does not consist in the mere acquisition of a little book-keeping and keeping invoices, &c. It is no Commercial education at all. Real Commercial education is of a very high order. We must first of all have a firm and broad grasp of the fundamental principles of economics both in its theoretical branch and in its practical application, in short, what Professor Ashley terms 'business economics.' We should teach what I call the Science, that is, the Higher Learning, of Commerce. There is all the difference between the mere routine man of trade and commerce and manufactures and the person who is well versed in business economics side by side with his legitimate avocation as a merchant, banker, manufacturer or producer.

Next, there is to be an Advisory Board. I suppose that does not need much explanation because without such a body nothing can be done. In these matters what we want is knowledge and experience. And an Advisory Board possessing practical industrial knowledge and experience is essential for our purpose. This Board should consist half of officials and half of non-officials.

The principal function of the Board shall be to offer advice in regard to old and new industries. It should be the fountain source whence all advice and information could be reliably obtained. It would be well if it confined its attention chiefly to Indian products and manufactures.

Then there is the introduction of new and improved methods and processes. We must all become scientific men as they are in Germany, America and elsewhere in the West. My guess is that it will take a century before we are highly trained in Science which we could apply to all sorts of practical industries. Processes and other things demand that training. We possess absolutely no such training. I think our young men must go as far as Germany and America for such training in order to

thoroughly understand the different processes of industry and apply them here. Again it presupposes a large expenditure for which money must be found. The example of Germany ought always to be kept in the minds of our young men. Thirty years ago Germany was like India purely an agricultural country. But the pursuit of science has been so extensively carried out that it now boasts of as many as 6,000 chemical laboratories. Its Government spends millions sterling per annum on them, whereas all that our Government spends here on every conceivable kind of education is only a paltry million and a half. Millions will be required in India before it is scientifically equipped and able to go into industrial processes as is the West. But let us make the humblest of humble beginnings. Let us not sit with folded hands.

There is also the further programme of the carrying out of investigation and experiments. I hope that the Research school endowed by the late Mr. Tata will soon be opened for study and that a fair start will be made by our countrymen in this line. If well conducted, the Institute would be of invaluable service to the country every way in the future.

As regards the development of selected industries, that is a subject I think that comes within our immediate scope. There are small industries and to very many of them our President referred in his eloquent address yesterday, which if properly attended to and stimulated would lead to great good in the near future. There are old industries which are decaying and dying. These need first to be practically taken on hand. We must select them on some well conceived plan and then do our best to gradually revive them so as to induce greater prosperity.

As to Exhibitions that goes without saying. An Exhibition cannot be started and revived without money. But we need not be very ambitious. What I would strive for is this, that each Province or District should have a quinquennial Exhibition. I do not believe in annual Exhi-

bitions which are only frittering away our resources and energies. We can show once in five years all the amount of the progress we may have made in our industrial march. In 1904 we had an Exhibition in Bombay. Suppose we hold another in 1910. We should be prepared to exhibit from each province the new industrial objects or old revived ones which we may have fairly accomplished during the quinquennium. That is how our Exhibitions should be organised in future. They should mark time and progress. Exhibitions again must be on the Kindergarten system so as to be really *educative* in our industrial regeneration.

Museums of course are the concomitants of Exhibitions. In Switzerland and other countries there are small Commercial Museums everywhere established and you will see every small village has a Museum of its own where every one might go and learn something very useful. If you go on in that direction you will accomplish a great deal in a few years. The village requires to be galvanised into industrial life.

With these few remarks I commend this proposition to you. (*Loud cheers.*)

Raó Bahadur G. SRINIVASA RAO (Madura) in seconding the proposition said :—Mr. President and Gentlemen,—The proposition before you has been so ably placed before you that it is unnecessary that it should have a seconder, especially one of my stamp just got up for the occasion. Nevertheless I feel that if I tell you what practically has happened in the district to which I belong, I shall make out a clear case. It will be needless to say any more about it and then you will at once carry out this proposition with acclamation. That Industrial education is an important factor in bringing about the future of this country is an undoubted fact. That a great deal is begun to be done already is also admitted on all hands. That of all the Governments in India, the Government of Madras has begun to move fast is also well known. I have not the

slightest doubt that, before long, the other Governments will also follow suit. In my District, of the various textile industries the dyeing operations are going on on such a large scale that any of you going over there will be surprised to find the drains even in the lanes all stained red. I am not sure that it is done in the scientific manner it ought to be done. The reason is not far to seek ; it is because we have not got institutions where we may have the training which India wants and with which the future of India is greatly bound up. Now any man turns to the industries without the particular education that they require. It is men with previous general education who ought to take to a special training. Men who have no general knowledge of the world take to it. When I say so, I do not mean that all are not to go in for it, the larger the number the better. But if really the better educated men, those who become graduates of our Universities take to it as kindly as they ought to and as greatly as India badly wants to-day, then, I assure you the regeneration of India will soon be coming. We have an Agricultural and Industrial Institute in Madura. I will say nothing about the Agricultural portion of it. Turning to the Industrial working of the institution, as we started it, we did not know what to do and how to proceed. We appealed to Mr. Chatterton. He was our kind friend. He asked us to go in for a sugar-cane crushing machine and we bought one at a cost of Rs. 5,000 or more—and there it is like a white elephant. With great difficulty we get the sugar-cane and the man in charge does the crushing in his own crude fashion, he is not able to do it in any very satisfactory scientific manner. Why? Who are the secretaries—I am ashamed to say I am one of the three and none of us nor any on the Committee knows more than that. We manage to collect the moneys for the work but the Knowledge which is really wanted we do not possess. When we turn to Mr. Chatterton he has to give the same stereotyped reply, that he has not the proper men to supply. We have no institutions wherein we can train the

men. Mr. Chatterton is now appointed as the Director of Industries and I for one expect great results from him and the Department created under him. What will be the result ultimately, one cannot easily divine now. Whatever it may be, the first beginning has been made and we have known none who has worked more zealously in the matter of our industrial improvement, who has taught us the value of oil engines, and how best water may be tapped wherever it is available, than Mr. Chatterton—I say, with him as head of this Department I hope there is a great future for us.

I tell you that the want that is greatly felt can only be supplied by the Government acceding to the prayer we make in this resolution. I tell you another thing—it will not do for the Government to do all this and for us to be idle. We must get all the money which is available, however poor India may be. Our regeneration is in our own hands. If we only care for ourselves and act in co-operation with one another we may realise all the money we want for industrial regeneration and if we do not do it, it will be our own fault. So over and above asking the Government to do what lies in its power, we must try ourselves to bring about the result contemplated by this resolution. As for the Bureau or Museum of Industries, this also is a thing in which a beginning has been made in Madura. But how to carry it on we do not quite know. Books are valuable no doubt, but to practically put it in a form is the difficult part of it and for it we want proper men. Our men have to receive the necessary education not only in this country but they have to go abroad and see how things are done elsewhere and then take up Industries here. When the resolution aims at so many things, when it is so many-sided that more could not be said on this occasion of limited time, I have simply to request you to pass it with the acclamation it deserves. (*Cheers.*)

In supporting the proposition, MR. R. V. MAHAJANI

(Akola) said:—Mr. President, Brother-Delegates and Gentlemen,—The resolution has been very ably put forward by our revered leader and by the speaker who followed him. So I need to add only a few words in commending it to you. The resolution deals with three points. In the first part of the resolution we ask the Government to extend the help they have been giving to commerce and industry by organizing a department of industry and by associating the Director with a non-official or with an official and non-official body of advisers—that is the first part. In the second part we have stated what this Board and this department are expected to do for the amelioration of the industrial condition of the country. When you find that it is impossible for private individuals to undertake experiments because their monetary condition is not satisfactory and they are unable to undertake such big undertakings, it is necessary that the State should undertake such things. It is what we ask the Government to do in the second part. In the third part we ask Government to organize Industrial Museums and Bureaus to give information to those who mean to start industries. In the absence of such bureaus it is impossible for private men to start any industries, because they cannot get any information on the subject. It is therefore necessary that experiments should be made by Government and there should also be a bureau to give information to persons who start industries. It is therefore necessary that we should be associated with Government in these matters and the Industrial Conference has laid down the lines on which we and the Government can work together. With these words, I commend the proposition to you.

The President then put the proposition to the vote and it was carried unanimously.

The Second Resolution. Technical and Industrial Education

In moving the second resolution the Honourable Pandit MADAN MOHAN MALAVIYA (Allahabad), who on rising was received with cheers, said :—

Mr. President and Gentlemen,—I have great pleasure in moving the second resolution which runs as follows:—

‘ That this Conference re-affirms the Resolutions of the previous Conferences on Technical and Industrial Education, and urges (1) that the Victoria Jubilee Technical Institute, Bombay, and the College of Science, Poona, be enlarged so that they may, between them, supply for the Presidency of Bombay technological instruction in all the branches of mechanical and chemical industries; (2) that the Government of India may sanction the proposal of the Government of Bengal to add classes in Industrial Chemistry to the Sibpur Engineering College; (3) that the Government of Madras will be pleased to give effect to the recommendation of the Ootacamund Industrial Conference that the Madras College of Engineering should be expanded into an Institute of Technology; (4) that the Secretary of State might accord early sanction to the proposal of the Government of the United Provinces that a College of Technology should be opened at Cawnpore; and (5) that similar institutions should be established in the Punjab, Burma and Eastern Bengal and Assam.’

Gentlemen, this resolution does not require any discussion. For years together now, both the highest officials of Government and the representatives of Indian public opinion have been at one in the matter of Technical and Industrial education. It has been recognised all round that this country requires nothing more to develop its industries than a system of education which will train up men who will be fit to follow industrial pursuits. Already you have seen that various Governments, the Governments of different provinces, have taken action in the matter. It is a matter of satisfaction, and it is our duty, to express our gratitude for the action the different Provincial Governments have taken. We feel that the time has come when the Government should devote a good deal more attention to Technical education than it has done in the past. Those of you who read the speech of Sir John Hewett in presiding over the Industrial Conference at Naini Tal last year will remember, how in one province the need is so great that if there is more than one Technological institution established, the number of students will not be too small for them. India is an agricultural country, but that does not mean that we are not to develop our manufactures. Time was when India

was a great manufacturing country ; besides, in these days, no country so large as India can be content with being merely agricultural. In the field of agriculture, think of what America has done—in the last 100 years it has had 134 Universities and the number of the Professors in America is, I believe greater, certainly not less, than the number of students who attend all the Colleges in India. Japan has developed a great system of manufactures. Less than 40 years ago Japan was an agricultural country but having introduced a well regulated system of Technical and Industrial education, Japan has built up her manufactures and is increasing them everyday. Formerly it exported its raw products only, but now its manufactures have considerably increased, the export of raw produce is gradually decreasing and now you will find that articles of Japanese manufacture are becoming popular in several countries. You have the example of these two countries. You cannot omit the case of Germany. About 1833 Germany was terribly envious of British supremacy in the field of industries and at that time students flocked to Government institutions, and as soon as they obtained some education there, they were anxious to obtain Government service as is the case now in India. The parents were anxious to see every one of their sons in Government service at that time. The fault was not with the parents that they were particularly fond of Government service—there was no other field of employment for them. Here in India also, the fault is not that they are very fond of it but there is no field in which they can find useful and honourable employment otherwise. The best way to induce our young men to follow industrial pursuits is not to tell them that they should shun Government service—I think it is the most mischievous advice to young men—but to open new careers for them where they could employ their time and talents and by their service to their fellow-men, add to the wealth of the country. Government service is public service of one kind, but there is no doubt

that if on the other hand young men took to manufactures and to industrial pursuits you add really, however humbly it may be, to the total wealth of the country and thereby render a greater service to your fellow-countrymen than you would otherwise. But before you can expect young men to be 'weaned from Government service to the extent that is desirable, it is necessary that there should be more institutions imparting Technical and Industrial education in all provinces. The resolution does not ask for too much, it does not ask even for all that is needed in the interests of the country. You see you require at least one centre in each province of this vast country where Technical and Industrial instruction of a valuable kind is available for our young men. Any of these provinces is equal to a large country in Europe, *e.g.*, the United Provinces are as large as Great Britain and Ireland, Bengal is a very large country, Germany, France and England will only be equal to one of your larger provinces. Therefore, when you go to Government with the prayer that they should establish one institution at any rate in every province, a big Technological institution, you are not asking Government for more than what is needed—I think really you ask for something less than what is needed. Germany has got 22 Universities and you know how German manufactures are now flooding the markets of the world. You know German goods are cheaper than British goods, which however are better, but you will find that German goods are coming into formidable competition with English goods. How have the Germans achieved this? As I told you, some 70 years ago they were not able to manufacture anything worthy of being taken into account but by developing a system of Technical education they have obtained a supremacy which creates apprehension in the minds of even the Englishmen. So also in the case of the other countries. Therefore, what is required above all to fight the problem of the poverty of the Indian people is that you must have ample provision made in every pro-

vince of the country for imparting Technical and Industrial education without which improvement is not possible. Without going into details I think you will all agree with me that we are asking only for what is most urgently needed in the interest of the masses of the people and I hope no financial or other considerations will be allowed to stand in the way of the establishment of such institutions at the earliest day possible. There is nothing I believe which India needs at the present moment which the Government and the people can combine to bring into existence, more urgently in the best interest of the people, than Technical and Industrial institutions scattered all over the country, (*Loud cheers.*)

In seconding the Resolution, the Honourable Mr. GOKULDAS K. PAREKH (Bombay), who was received with cheers, said :—

Mr. President and Gentlemen,—I have much pleasure in seconding the resolution which has been so ably moved by the Honourable Pandit Madan Mohan Malaviya. It does not require any demonstration that industrial advance is one of the things which is needed for the good of our country. It does not require particularly demonstrating that this advance is considerably retarded in consequence of the want of technical and industrial education. It is therefore necessary that, if not in many places, at all events, in one or two places in every province there ought to be an institution in which sound technical education may be given. The honourable mover of the proposition has told you how much some other countries have advanced within a few years in consequence of the facilities given for the imparting of industrial education and in order that this country may have this facility it is necessary that there should be schools and colleges in every province on a sound and practical basis. We have before us a scheme for advancing the facilities of imparting this education in almost every one of the provinces of this country ; and speaking for the province from which I come, we have the

proposal for the improvement of the condition of two of the institutions in which technical education is attempted to be given. In 1888 we started what is known as the Victoria Jubilee Technical Institute in Bombay. So far as it goes, it has done its work pretty fairly but it has not been able to do as much as it was expected to do; and the reason was that it did not receive such assistance as the necessities of that institution required. It is therefore necessary that that institution should considerably be strengthened. It ought to be able to give much higher education than it has been able to do. The other institution is the College of Science at Poona and in connection with this institution I am glad to tell you that our present Governor, Sir George Clarke (*cheers*) has been taking a very keen interest in the advancement of industrial and scientific education of the Presidency, and the result of his efforts has been that two large donations have been given for enabling Government to have Colleges and institutions put on an exceedingly strong basis. With the help of these institutions and with the help of Government, I expect that in a short time we shall be able to see that the means of imparting technical and scientific education in our Presidency is put upon a sound basis. More and more of these institutions are needed and it is only the advance of these institutions that can help the advance of the industries which are necessary for the good of the country.

With these words, I put the proposition to you. (*Cheers.*)

MR. T. RANGACHARIAR (Madras), in supporting the proposition said :—

Mr. President and Gentlemen,—I have been selected for Madras to speak on this proposition to give the weight of the support of this Conference to the recommendations of the Industrial Conference recently assembled at Ootacamund. You all remember that in September last a Conference was convened by our Government to consider the Industrial development of this province. It was

composed of officials and non-officials and I have had the good fortune to go through the mass of information which has been collected in that Conference. Much good work has been done in that Conference and the Government are taking eager steps to promote the objects aimed at by that Conference. One of the recommendations of that Conference is to develop our Engineering College into a highly developed Technological Institute. Gentlemen, much time has been wasted both by the Government and the people in considering the question of the necessity of Technical education. It is now beyond dispute that Technical education is necessary if the betterment of this country is to be secured at all. There was a time when there was a question as to whether men in the army should be trained first before the Generals and Commanders are trained. His Excellency the Governor has pointed out in his speech in opening the Conference that both are necessary in order to take a step forward. It is no use having the men without the Generals, it is no use having the Generals without the men, and in that view the Industrial Conference has made a distinction between Technical education and Industrial instruction. They have defined Industrial instruction to be instruction in the performance of definite operations which need not necessarily involve the teaching of general principles but only of their application. The object of Technical education is to train the student to apply theoretical principles to practical purposes and to make use of theory in solving such problems as arise in manufacturing processes. Technical education must be based on scientific education and the Conference has marked the difference between the two forms of education and our resolution embodies that distinction. We make the distinction between the two and say that both ought to be developed. So far as Industrial education is concerned the Government have issued orders recognising its importance and they are taking steps to promote the same; but unfortunately, owing perhaps to differences of opinion as to

Technical education, the Government have not taken steps to accept and act upon the recommendations of the Conference in this regard. The recommendations of the Industrial Conference are contained in these resolutions :

'That the Conference is of opinion that it is desirable that the control of any Technological Institute and of technical education should be under the Director of Industries.

'The College of Engineering in Madras should be expanded into an Institute of Technology with complete laboratory and workshop equipment; and education should be imparted in it in Engineering in all its branches, in Applied Chemistry and such other technical subjects as are suited to the needs of the country.

'It is desirable that arrangements should be made to enable students from this Presidency to take full advantage of the facilities offered by the Indian Institute of Science at Bangalore.'

It is this recommendation which has not yet been given effect to. That there should be a highly equipped Technical College for each Presidency cannot admit of serious argument. Well then, what is the difficulty in giving effect to the recommendation of the Conference? Gentlemen, so far as our Presidency is concerned, this scheme of expanding the Engineering College into a Technological Institute is not new. After the Royal Commission of 1884 the Government of Sir Grant Duff took up the subject of developing Technical education in this Province and the then Director of Public Instruction reported as to the best means of developing the Technical institutes. One of the recommendations Mr. Grigg, the Director, then made was that the Engineering College should be developed into a Technological Institute. He made three recommendations and two of them were carried out, but so far as the Engineering College was concerned it was not given much effect to, although some advance was made at that time. The Engineering College is a very ancient institution as we of this province know. It was started as a mere surveying class in the eighteenth century—in 1794 I think, it was developed in 1859, it was remodelled after the Roorkee College, and in 1884 it was again developed. It was not a real

développement. It is, of course, a costly thing and it is idle to expect people, however interested they may be, however enthusiastic they may be, however patriotic they may be, to bring such institutions into existence. If you look at Germany, Japan or America you will see it is the State which acts most in these matters. In some of the States of America nearly half the revenue is spent upon educating the people, but compare what has been done in this Presidency. If you look at the figures for 1906-07 you will find out of 97 lakhs spent on education only three lakhs are spent on Technical education, that is only 3 per cent. of the outlay of the education, and for all India out of a total revenue of 125 crores only 3 to 4 crores are spent on education. In no other country does the State spend so little on education and you can expect little development, either general or technical, when such is the case. Gentlemen, it is the duty of the State to take it up. It is now not the time for argument, the time for action has come. The Industrial Conference has made these recommendations and we shall give the weight of the support of this Conference to them and we only hope that our sympathetic Government will carry them out in a very short time. With these words I beg to support the proposition. (*Cheers.*)

LALA DHARAM DAS SURI (Lahore) further supported the proposition, and in doing so he spoke of the state of technical education in the Punjab.

[Speaking at a later stage of the proceedings, Professor B. Heaton, Principal, Sibpur Engineering College, Calcutta, addressed the Conference as follows on the subject of this Resolution.]

Professor B. HEATON, who was received with cheers, said :—Mr. President and Gentlemen,—I did not think a fortnight ago when I was asked by your Secretary to write a paper on 'Industrial Education in Bengal,' that I would be coming to Madras, and indeed I did not think until I arrived in this hall this afternoon that I would be asked to

Speak so that I might collect my ideas. So you must excuse me if I am somewhat disconnected.

I want to make a few general remarks on Industrial education in Bengal, and chiefly upon technical education in Bengal. We have in Bengal the Sibpur Engineering College, of which I am the Principal, and we have a large number of affiliated technical schools. There are 14 schools in all in Bengal including Eastern Bengal and Assam, all of which teach a portion of the course of the Sibpur College. They teach what corresponds to your Sub-Overseer's course here. But we differ in Bengal from every other province in India, in that the Sub-Overseer when he has got his certificate, may at once be admitted to the Overseer class and come up for higher education in the Overseer class. The Overseer course was in three branches of Engineering, in Civil Engineering, in Mechanical Engineering, in Electrical Engineering, and in Mining. Now this Mining branch was started three years ago at the request of the Government of India for the benefit of the whole of India, and I am ashamed to say that up to this time, practically the only students I have admitted have been my own students; and realising this, I have come to Madras to see if anybody from this province wishes to be educated in Mining and to join our Mining classes. I am also going on to other provinces on a similar mission. We have also at Sibpur, University classes teaching for the B.E. degree of the Calcutta University and those also we hope to give in the same three branches of Civil Engineering, Mechanical Engineering and Electrical Engineering and Mining.

I see in this Resolution you allude to the class of Industrial Chemistry in the Sibpur College and you express the hope that the Government of India will sanction the proposal. This scheme went to the Secretary of State for India about two years ago with a very strong recommendation from the Government of India. From information got in England, I heard that it was about to be sanctioned about a year ago. Unfortunately, somebody whispered the

word of caution to the Secretary of State and he telegraphed out to India for definite proof that these classes were required in the country. I then had to go and make out a case, but when it was evident that similar classes were started in Calcutta by the leading members of the Indian community it was not difficult to make out my case, and the Government of India sent back this proposal to the Secretary of State two months ago and I am hoping to be able to open these classes, well, at the commencement of the next session.

Then we have in Bengal, after three years' hard fighting, managed to start our Weaving School. This scheme went up about three years ago and we have been trying to get a Principal for the Weaving School and only about a month ago we could get one. First we offered too small a pay, then we raised it and then we have been able to get somebody to take up the School at Serampore and it is to be the centre for all over Bengal.

Before I sit down, there is one word I should like to say about the Sibpur College. In connection with this new course of instruction it is of course necessary to reconsider the conditions of admission to the College and in putting forward my proposals to Government, I have in every case insisted very strongly, that I shall be permitted to reserve a certain percentage for what may be called the special student, as opposed to the student who comes to the College only with a Government job in view—such a man does no good to the country, he does good only to his pocket—special students will come with the idea of how to make use of what we teach. If he wants to become an electrical engineer, it must be with the intention of developing some particular industry or other, and in every case I am trying to insist that 20 per cent. of my admissions must be for special students. But I should like myself to have it the other way—80 per cent. for the special students—that would have to be the broad end of the wedge. (*Cheers.*)

[When Professor Heaton resumed his seat, the President said :—On behalf of you all I thank Mr. Heaton for the information he gave about the Sibpur Engineering College. (*Cheers.*)]

The PRESIDENT :—Before I put the proposition to you I have one or two words to say. It might appear to some as though this proposition exhausted all the recommendations we had to make to Government in regard to this matter. But this is not so. I would only ask your attention to the first clause of the resolution which says 'that this Conference reaffirms the resolutions of the previous Conferences.' In the proposition that was put forward in the second Industrial Conference at Calcutta, a complete scheme, as it appeared to the Subjects Committee of the Conference, was drawn up and placed before the Conference—a scheme that stated the things we had to strive for a number of years. Keeping that in view, we put forward certain recommendations which have to be definitely carried out at the present time, and these are the things which are set out in this proposition. There was considerable discussion about this proposition in the Subjects Committee but I only ask that for some time we should direct our energies to see that the recommendations made in this proposition are carried out, and any higher programme that some accomplished gentlemen have in view must be reserved to be carried out later. But first of all, let us do the practical work needed for our immediate requirements. What we have stated here, even that might be considered 'a large order by some people. We did not make any reference to my province, because there the work has been taken in hand, and what has been sanctioned is about to be started. In the development of industries, it is the Bombay Presidency which takes the lead, and we pay particular attention to the provision of instruction in industrial chemistry there. It is a great want of the Bombay Presidency. And in the two great institutions it has got, we ask that provision be

made for instruction in all the mechanical sciences and the chemical sciences. Gentlemen, as I have said, it is not possible for us to have a completely equipped polytechnic institute for every province, and we do not know whether such an institution will be provided in the immediate present for all India. In the meantime, we are anxious to have between the institutions existing in the different provinces as complete a course of instruction as it is possible to have under our present circumstances. With this explanation I put the proposition for your acceptance.

The proposition was carried unanimously.

The Third Resolution. Commercial Education.

MR. K. SUBRAMANI AIVAR (Bombay), in moving the next resolution, said :—

Mr. President, Brother-Delegates and Gentlemen,—I have very great pleasure in being entrusted with moving this proposition which deals with Higher Commercial Education. The proposition runs as follows :—

‘(a) That in the opinion of this Conference the time has come for the Indian Universities to create Faculties of Commerce and institute Degrees in Commerce, and to affiliate Commercial Colleges that will prepare candidates for University Degrees in Commerce ;

‘(b) That there should be established one College of Commerce at each provincial capital and that it should include provision for the training of teachers for Commercial Schools in the mofussil.’

It is an all-embracing proposition relating to the training of merchants and bankers. It would have been more proper if it had been placed in the hands of our merchant princes of Bombay, but it is gratifying that in the discussion in the Subjects Committee a casual remark, a very encouraging remark, was made by one of our leading captains of industry, I mean Sir Vithaldas Damodher Thackersey, to the effect that this proposition was already too late, that it ought to have been passed and carried a decade ago. That was one encouraging remark. Another great suggestion was the remark which Mr. D. E. Wacha

made, that the time was very ripe for the recognition of Commerce by our Universities by the institution of Faculties of Commerce and by the awarding of Degrees in Commerce. The question has been under discussion for 25 years, and Madras may be proud of this, that the first institution was started in Madras, not by the Government, but by a private body—the Trustees of Pachaiyappa's Charities. But it remains an elementary school. What we now plead for is the recognition of the study by the Universities. We have got to convince the Senates of Universities that this study deserved recognition and that there was enough to be taught which would give our young men culture in a course of University training in Commerce. What we mean by the Science of Commerce is not the teaching of the retail shop-keeper how to sell plantains or snuff. Commerce does not mean retail trade—commerce is vastly more than retail trade. We talk of commerce only as between one nation and another. The other day I met a bright student who studied political economy without knowing what exchange is, who studied it only in its theoretical aspect, without knowing what the par of exchange is and how foreign exchanges have really to be dealt with. Their knowledge is bookish merely—it is teaching science without a laboratory. Political economy cannot be taught without attention being paid to banking problems. Economic history and Banking problems are of such a high character that they can be studied and taught efficiently only in a University career. In England and Scotland during the last five or six years it has been found necessary to establish small Universities to teach Commerce and to institute degrees in Commerce. This is more an appeal to University Senates where we Indians are sufficiently strongly represented. If the Senators make up their minds and see what exactly the curriculum is, as prescribed in English Universities, they will see that Commerce is something worth recognition here. Then we shall not have the

teaching of political economy without the student knowing anything of foreign exchanges or what is meant by exchange being favourable or unfavourable. I speak from personal knowledge and it is with considerable difficulty that I have been able to make pupils understand what is favourable and unfavourable exchange—it is a great bugbear to them. If political economy is taught properly—and Professor Lees-Smith will support me in saying so—it is absolutely impossible to do so without giving lessons in Banking. I know that professors of political economy have asked their students to go into the library and look for a copy of a standard text on the subject, where they would find what foreign exchange means and what a Bill of Exchange is. Without the study of Banking a true knowledge of Political Economy is an absolute cypher.

Now I will say one word about the second part of the Resolution. These Commercial Colleges have to be affiliated to the University. Within these Colleges and for these University degrees, is there enough to be studied? Here I hold in my hand the Syllabus for Examination in the Institute of Actuaries, by which premium tables are prepared for Life Assurance. Mathematics graduates will follow me when I say that there is a theory of average and of probability which is eminently true. To pass the examination of the Institute of Actuaries, there are four parts of it. I shall tell you what is prescribed for part one.

[The speaker read from the Prospectus of the Institute.] If that is not University education I wonder what it is, what is culture? Let our merchants endow Commercial Colleges in the absence of Government institutions. They will be much less costly than Technological institutions and this is much more really in our hands than in the hands of the Government. At any rate in Bombay we shall have this fulfilled. Lord Northcote put his heart and soul in it, but there was some opposition and it was side-tracked. But now with Sir George Clarke, who cannot be so lightly treated, there is every hope. Even within the last

year he has been taking such active steps that we shall have one soon in Bombay. It is a pity we cannot have it in Madras where the Elementary education first began. I will not occupy more of your time with this proposition. I hope that the day will soon come when we shall have our graduates in commerce who shall be able to stand on their own legs. I assure you, our graduates thus prepared, will be able to stand on their own legs. There is the Banking profession,—its growth is remarkable,—the Banking profession offers very great scope. There is the local Bank that wants men, that wants to open branches, and young men are wanted to be in charge of them. With these remarks I commend the proposition to you. (*Cheers.*)

MR. D. G. DALVI (Bombay), in seconding the proposition said :—

Mr. President and Gentlemen,—The learned speaker who has preceded me has spoken with the authority of an expert on the subject which is the subject-matter of this resolution, and I find that my task is therefore comparatively lessened. All that this proposition requires is, that commercial education, and industrial education in addition to it, should form a part of the University curriculum and should be recognised as a part of higher education. Now, Gentlemen, this subject is no more a matter of pure discussion. It has come within the pale of practical politics. As Mr. Iyer has told you, in the province to which I belong, I mean the Presidency of Bombay, our popular Governor, Sir George Clarke, has already declared in his last letter on technical education that Commerce also should receive adequate recognition in the University curriculum. Speaking on this subject, I find there are two or three considerations which suggest themselves to one on the surface. The first question which may be naturally asked is, Do commerce and industry lend themselves to study in the higher branches? On this subject the best answer in recent days has been given by our veteran publicist Mr. D. E. Wacha (*cheers*), in a paper which he

read on the subject before the Graduates' Association of Bombay entitled 'The Science of Commerce.' In that paper he has conclusively proved how the facts of commercial experience and industrial knowledge have in recent years been correlated and co-ordinated, so as to form a new science which he calls 'the science of commerce.' This science requires as thorough and close a study as any other science in these days of specialisation, and gentlemen who take degrees in it are worthy of the course they have gone through.

The second aspect of this question relates to the necessity of having regular Faculties of Commerce. Now a Faculty of Commerce, as a faculty of every such subject which the University encourages, is absolutely necessary, in order that the University may have on its Senate and its Syndicate persons who have the requisite knowledge and experience, for the purpose of advising the Universities on measures adopted in connection with that subject, for the purpose of maintaining an efficient control over that subject, and in order to place within its easy reach, expert advice on that subject. Gentlemen, I do not dwell on this subject very long for the simple reason that there will be a gentleman who will follow me, who will speak with greater authority. But there is one objection which has to be answered with regard to this question—at least as regards the University of Bombay. I remember that at the time when this proposition was first brought forward it was ridiculed as a suggestion for a faculty for basket-making, for smithy, for carpentry, as if the University was not the place for studying higher literature as regards commerce and industry. The best answer to this sort of criticism that could be given would be three-fold. First, I would say that our notion of a University has to be revised as we progress from stage to stage. A University is a place for universal knowledge and if in the last half a century the conditions in this country as well as in the East have changed, should not the University make further progress with a view to provide the

necessary knowledge that is required by the age? With regard to the University of Bombay I would add that there are no other centres which can take the initiative on this subject, it is the University which not only has to follow the requirements of the age but also to anticipate them. With these words I will commend this resolution to your hearty acceptance. (*Cheers.*)

The PRESIDENT then said :—

Gentlemen, there is amongst us to-day a distinguished gentleman, an authority on commerce and statistical matters, who has lately come to Bombay at the invitation of the Government of Bombay—I refer, Gentlemen, to Professor Lees-Smith, who has been delivering a series of lectures of the most interesting and instructive character, lectures which throw light on matters in respect of which the majority of us are ignorant. Mr. Lees-Smith has kindly come to attend this Conference and on behalf of you all, I request him to address this Conference.

Professor LEES-SMITH, who was received with loud cheers, then delivered the following speech :—

Mr. President and Gentlemen,—I have eagerly seized the opportunity to address this Conference, because I was intending in the course of a few days to put certain proposals before the public of India through the medium of the Press; I am going to take the opportunity afforded by the publicity of these proceedings to make the proposals here. First of all, to speak of the general question; the problem which you have to consider is, would you take your place in the march of manufacturing nations? What type of men do we want our businessmen and our commercial leaders to be? Now, the old school of commercial men give to that question a very simple answer. They say we want a practical man. We want a man who goes into office at the age of 14, who spends a year or two there, who then rises from one rung of the ladder to another, until finally he is a thoroughly business-like commercial leader, because he knows practically every part of the

business. Now, our answer to them is this. You mean then, that your commercial leaders are to be only half-educated men, that they are to be so immersed in practical details from the age of 13 or 14, that they know little or nothing outside the technicalities of their business. We have another type to put before you. Our claim is that the leaders of commerce and business need to be scientifically trained just as a doctor, or a barrister or a professional man is. Why has it always been taken for granted that a business-man need not be an educated man in the same sense as other professional men are—because of the fact referred to by your President in his opening address yesterday—because the qualifications required for business have always been regarded as commonplace. Now, Sir, modern experience shows us that business requires administrative capacity of the very highest type. It needs not merely technical knowledge, but it needs the power of dealing with new situations, of going forward at the right moment, and of controlling labour. These are just the qualities which Universities have always claimed as being their special business to foster; and we therefore say, that if you are going to fulfil any of the hopes which were held out yesterday by your President, if you are going to take into your own hands the control of the commerce of this nation, then you must produce wide-minded, enterprising men of initiative, men who are likely to be produced by the University Faculties of Commerce. Now, there is one point which I shall make clear, and that is that the training in a University Faculty of Commerce is not divorced from the practical life of business. The University Faculty of Commerce is intended, of course, to train the judgment and to mould the minds of men. It is claimed that, although it must give primarily a liberal education, it is possible to give that education which has a direct and practical bearing on business life. I am not going through the curriculum, but just imagine to yourselves a young man of the age, say, of 21. If he has been an intelligent student in a Faculty of

Commerce, that young man at that age will be able to enter into the most intricate financial discussion. He will be able to follow the fluctuations in the foreign exchanges and to analyse the reasons for them. He will understand the organisations of all the great industries. He will be able to write a good business letter in English and one other foreign language. He will have to study the sciences which bear upon the industries in which he is likely to be engaged. He will have examined all the tariffs of different nations as also their trade. I claim, although such a man has never been a day in an office, he will have at the age of 21 an amount of knowledge which an ordinary businessman is only able to obtain after years and years of experience. He will understand scientifically many of those phenomena which ordinary men of commerce only understand dimly, because they have never entered into the reasons behind them. That kind of man has immense possibilities in the world of commerce. He is the kind of man on whom you must depend to lead you in the industrial march in the future. On him you must depend to free you from the domination of employers and capitalists of the British race.

Well, I now wish to turn to a different subject. It is connected with what I have said, but it deals with a matter which it is not my special business to lecture upon for the Government of Bombay and which I therefore wish to ventilate here. We are imposing British institutions upon this ancient civilisation. It is a vast experiment, and it is going to be watched by exceedingly keen and critical eyes during the years which are immediately before you. Now, I and others in Great Britain have been impressed, when we saw what was coming, with the profound necessity of allowing a certain number of those who are going to control the institutions which have been conferred upon you, the opportunity of studying their working in Britain itself at first hand. Now, let me make two qualifications. I do not mean that you are not to send your sons through

your own Universities. They are the Universities which understand Indian conditions. They are the Universities which it is your peculiar duty to support, but what we claim is something smaller than that, something which will supplement University education. And there is one other qualification. I speak of imposing British institutions upon this ancient civilisation. Whatever the future may hold out, I think there are few thoughtful men who wish you to adopt British institutions without modifying them to suit your own requirements. You have a genius and civilisation of your own. What you need to do is to take the institutions of Great Britain, to modify them and adapt them to your own capacities and needs, so that finally they will not be British, but they will be truly Indian institutions. (*Cheers.*)

Now, let me come to the subject. I want while I am here, to persuade a number of leading Indian gentlemen in view of the movement which is ahead of you, in view of your duties in the future, to send their sons to Great Britain, not for University education, but, even for the space of a few months, to study British institutions and British life, study them in the land of their birth. You will find that if you do so, although the time may be short indeed, the mark of Britain will be on them for the rest of their lives. They will never be the same men again. Now, we come to certain difficulties. There is some danger of going to a country like England for a few months, say six months, as you might do in India, and leaving the country at the end of it about as ignorant of it as when you came. Now, I am going to put a definite proposition. I have come to this country as an emissary of an institution known as the London School of Economics and Political Science. In that institution is concentrated the economic and political teaching of the University of London. You will see that owing to its position as the great centre of economic and political teaching at the head-quarters of the British Government, it is in touch

with all public institutions and public men from Prime Ministers, Peers, Trade Union leaders, and socialist agitators. On its governing body is a man whose name will always be famous in the annals of this land—I mean Sir Courtenay Ilbert. I imagine some of you younger men may consider that Sir C. Ilbert is a figure of the past, but in point of fact I was myself associated with him as an examiner in the London University barely a month ago. The proposition is this. If a number of these young men who are likely to be engaged in working these institutions are sent for a few months across to England, special arrangements will be made to guide them and teach them by the authorities of the London School of Economics. That is, we shall not leave them merely to attend the ordinary classes. It is my particular object that, as one of the results of my visit to this country, we shall get into touch with India. Therefore, we should make special arrangements; we should organise special lectures, and we should organize special classes for them. We should endeavour in them to explain British institutions and British life as they really are. We should try and give them first hand information and send them on visits to various institutions, and we shall take care that they are explained to them by men who are actually engaged in conducting them. We are in a position to introduce them to the most representative Englishmen of every school of thought and every position. Now, Sir, I believe that if you can have even a small proportion of men trained under these conditions and give them a few months' experience of this sort to work the institutions which have been conferred upon you, it will mean an immense help to the political development of the next few years. It will do much to smoothen the way and to facilitate the working of the reforms that have been granted.

Well, now, that is a practical suggestion. Any who are either here or read what I have said and who wish to follow it up should write to me, to the care of the Government

of Bombay, and if there is the response which I anticipate, then immediate steps will be taken to carry out the arrangements which I have outlined. (*Loud cheers.*)

The PRESIDENT in putting the Resolution to the vote said :—

Gentlemen, before I put the proposition to you, on behalf of you all I tender our heartiest acknowledgments to Professor Lees-Smith for the instructive words which he has uttered to us and for the suggestion which he has made to us. I am sure that the proposal which he has made before you will meet with a hearty response and the plan which he has suggested will be considered and thought over by us and steps will be taken to take advantage of the proposals made by him. In regard to the proposition itself, its propriety has been shown by a gentleman who has great authority in the matter and I am sure the proposition will commend itself to you and you will carry it with applause. (*Cheers.*)

The resolution was then unanimously carried.

The Fourth Resolution. Agricultural Banks.

Mr. LALUBHAI SAMALDAS (*Bombay*), in moving the next resolution said :—

Mr. President, Brother-Delegates and Gentlemen,—
The resolution I am putting before you runs thus :—

‘That this Conference again invites the attention of the Supreme and the Provincial Governments to the urgent need for Agricultural Banks both to assist Co-operative Credit Societies and, in cases where Co-operative Credit Societies cannot or will not serve, to advance loans directly to agriculturists on easy terms and urges them to take early action in the desired direction in conjunction with Indian capitalists who, the Conference feels confident, would be ready to co-operate with Government in any such scheme.’

A similar resolution was passed last year and sent up to the Government of India and it was considered at the Conference of Registrars at the last Simla Conference and referred to a Committee. The Committee did not come to a unanimous opinion on the subject. They thought the matter was not ripe. Therefore it is necessary that we

should repeat the resolution. The resolution, you will see, is divided into two parts. The first is about the urgent need of Agricultural Banks. As regards that, I do not think much has to be said. Sir Vithaldas Thackersey yesterday said all that had to be said about it. There is a difference of opinion as to whether these Agricultural Banks may be allowed to deal only with Co-operative Societies or even with individual agriculturists. Madras has started a Central Bank of its own and under the able guidance of my friend Sir V. C. Desikacharry, it has been successful and so Mr. R. Ramachandra Rao does not want one. But in our province there is necessity for a Bank and it will really be hard that we should not have a Central Bank. We want the Government to give us a Central Bank with power to advance money to agriculturists on easy terms. The third thing we want is that Government should take early action in conjunction with Indian capitalists. We want the Bank to be managed by Indian capitalists, that is why stress is laid on 'in conjunction with Indian capitalists who, the Conference feels confident, would be ready to co-operate.' You see that we at least in Bombay are prepared to work in conjunction with the Government in starting a Central Bank. With these words, gentlemen, I commend the proposition to you. (*Cheers.*)

Rao Bahadur KHANDUBHAI G. DESAI (*Surat*), in seconding the resolution said :—

Mr. President and Brother-Delegates,—I have great pleasure in seconding this resolution and in doing so I would advert to the remark of my friend Sir Vithaldas Thackersey, that in all the four or five resolutions we have to ask the help of Government. I must say that as it is worded this resolution also asks the help of Government, but really speaking it is not the help of Government only that the resolution asks for, but we have got to help ourselves to a large extent, because Government cannot go on advancing always the crores upon crores which would be wanted to develop our industries and agriculture. Just to

take a small instance, if we were to find the money required for manufacturing the 10 crores worth of sugar which we import, we should want half that amount to manufacture that quantity of sugar. Now such a large amount cannot all be got by our people at once. But if there be some scheme by which the required money would be advanced to the people, then the Government in giving us help need not find even a single pie themselves. What they might do is to give some sort of guarantee to the banks which might be started for the purpose of giving advances at a very reasonable rate of interest to all the agricultural associations which might be started in different districts and villages. Then the people themselves would raise a certain portion of the capital. In this way a large amount of capital which lies now dormant in our villages and in the hands of small people can all accumulate so as to enable them to carry on the improvements which we want in agriculture. In fact, I may say that compared with other countries we are producing much less per acre on an average. It is the want of capital, the want of the necessary education, the want of the necessary appliances, that has kept us so backward. Some of us have very good ideas about agriculture but capital is not available to all the people to carry them out. But with the help of the Co-operative Credit Societies we can get the capital from the people themselves and also get them to help one another. The help of the Government is required to inspire confidence in the work. One of the proposals which was brought forward before the Conference which was held in Bombay under the auspices of the Bombay Government a few days ago was that for the Bombay Presidency a Central Bank should be started, but the promoters insisted that before they could find all the capital required, they would find it necessary to get some guarantee for the debentures they might issue. I might give one or two details. The capital is, to begin with, say 5 lakhs; it is proposed that the Bank should be enabled to issue debentures

up to three times the amount—and on the debentures only was the Government asked to give a guarantee of 4 per cent. Now we know very well that without Government guarantee we should have to pay up to 10 per cent. on the money we tried to raise—generally business people count upon 6 to 10 per cent. It means a certain amount of risk. But when Government guarantee is given a large number of those who cannot themselves enter into business are quite satisfied to find the necessary money at 4 per cent, Government for their part will not be losing anything. Government means really the general tax-payer. Now, what we have to see is that the Government does not do anything by which the general tax-payer is injured. Finally, therefore, the agriculturist will get the money at a much cheaper rate than on his own credit. There is the $\frac{1}{4}$ th part of the capital to fall back upon in case of loss. In all this, there is a certain amount of risk and this margin is absolutely necessary for the safety of the Government, that is of the general tax-payer. In connection with the same thing help was asked in another direction. It was, that instead of the present method of recovering dues by going to the Civil Courts, if Government were pleased to allow some sort of summary process of recovering the money, it would be of very great advantage. Perhaps the Government is not willing to do all that, but the Conference passed a resolution that some such sort of a summary process might be allowed. The Chairman held out some hope that the Bombay Government would take it into consideration and try to take the matter to the Government of India. After all it was not a case for the Provincial Government to do anything but to place the matter before the Government of India who are the only authority competent to decide such a matter. We want the help because our country is so poor. I mean by country, the country as a whole as well as the poorer people. The poorer people are so very poor, that while on an average each person in England has an income of

Rs. 600 per annum, each person in India has an income of only Rs. 30—this is on the authority of some enquiries that Lord Curzon made. Others put it at less than Rs. 30—*i. e.*, less than $\frac{1}{20}$ th of the average income of an Englishman. Our agriculturists do not get all this. A large proportion probably belongs to the upper class, so possibly out of our 30 crores only 2 crores of the people have the income of 5 crores, whereas, the remaining 25 have to be satisfied with the 300 or 400 crores. Thus you will see that each agriculturist has to live upon a pittance of Rs. 15 per head. I suppose everybody here can see that it must be a very hard life for these people to live at the best of times, and when famine comes it is not surprising that they have all been getting into debt and instead of improving, they are going down more and more. Now, if by means of these Co-operative Credit Societies and with the help of Government central banks which might be started we could place cheap money in their hands we might be able to make them rise—instead of producing only Rs. 15 worth of produce an acre on an average we may have it doubled. If sugar is properly raised we may get Rs. 1000 worth from one acre—even now, without Western knowledge, on fairly good soil we can raise Rs. 500 worth. But for this they have to spend about Rs. 300. And for all this we want money, so that it is absolutely necessary to start the Co-operative Credit Societies all over India. Government should come to our help to a certain extent. It need not give money, but it should give its guarantee. With these remarks I beg to second the resolution. (*Cheers.*)

Rao Bahadur V.K. RAMANUJACHARIAR (*Kumbakonam*) in supporting the proposition said :—

I beg to support the proposition which has been so ably moved and seconded. I have no knowledge of the circumstances of provinces other than Madras ; but so far as this province is concerned a central bank like the one proposed is absolutely necessary. We have several classes of credit institutions in this province but, as they are

constituted, they cannot lend large sums of money at a cheap rate and repayable within a reasonably long time. We have first the class of Co-operative Credit Societies both rural and urban. I have some experience of a rural society in my parts. Its funds are limited ; it lends only to its members and the maximum period for the repayment of the loan is one year only. I presume that in these respects other rural societies are exactly alike. The urban banks in the chief towns and the premier bank in Madras have much larger funds, but I understand that they lend to rural societies only. We have other lending institutions under the designation of Mutual Benefit Funds which allow a much larger time for repayment. In some Funds it is 7 years, in others 45 months. But they insist upon payment month by month of a subscription proportionate to the amount of the loan and of interest on the total amount of the loan for the month. This arrangement is unsuited to agriculturists who are unable to make monthly payments, as they can obtain funds only sometime after harvest. There are various banks in the province taking deposits and making loans on advances but the period of their loans does not ordinarily exceed three months, and they consult the convenience of traders and merchants more than that of landholders. A bank which will lend large sums of money to landholders, take reasonably low rates of interest and wait for some reasonable time for repayment, is therefore greatly needed in this Province. There are no doubt individual money-lenders who lend large sums and wait for repayment ; but their terms are hard and people are unwilling to put themselves in their power. I therefore support the motion.

The resolution was then put to the vote and carried unanimously,

The Fifth Resolution. The Cotton Excise Duty.

Mr. UTTAMLAL K. TRIVEDI (*Bombay*) in moving the next proposition said—

The proposition that is entrusted to me runs thus:—

‘That this Conference records its emphatic protest against the continuance of the Excise duty on Indian mill made cloth as an unjust and unnecessary impost and urges that it should be removed without delay.’

This is a proposition which requires not many words for its commendation to you. You will remember—I remember it very vividly—that when the Excise duties were imposed, at a time when the Liberal Ministry was in power in England, Sir Henry Fowler, now Lord Wolverhampton, said from his place on the Treasury Bench that every Member of the House of Commons was a Member for India. And what was the effect of this declaration? All the 600 and odd members imposed on the nascent industry of the day, a duty which has been taking gigantic strides and now amounts to 35 lakhs a year. The injustice of this imposition stands almost self-revealed. We know that capital in our country is not bold as it does in the countries of the West. We have to undertake and carry on these industries at a very great disadvantage. We are not in a position to declare high dividends and a portion of the margin of profits that is left to us is taken away in the shape of the Excise. Nothing more need be said upon it—it is a disadvantage and one that cannot be removed by anybody except the Government. I do not want to add much to what the President has said in his inaugural address, that it is an injustice which should not be quietly tolerated any longer. In that word is summed up a volume of argument, and Gentlemen, the only hope on which we can rely is that the reforms now inaugurated by Viscount Morley may give us some power in our Legislative Councils to consider this question from an equitable standpoint. With these words, I commend the proposition. (*Cheers.*)

Pandit RAMBHAI DUTT CHAUDHURI (*Lahore*), in seconding the resolution said :—

Mr. President and Gentlemen,—I have been asked to second this proposition and I think that it is a proposition of which one can say that it is something which does not require any great study. The matter is simply this. The Government always assures us that we are the children of the Government, in that it is in the position of a parent to us. Therefore we say, we call them, father and mother, and are we, your children as well as the people of Lancashire? Then, why 'should we, as good children, be made to suffer this special unjust impost? On what principles of justice, of ethics, of religion or economics can we upport the imposition of the tax? I say it is absolutely unjustifiable—it is a piece of injustice which can on no ground whatever be excused, and therefore—I think I need not waste your time—we have been sitting too long—I would submit that this unjust tax should be at once removed if there should really be good feelings between Europeans and Indians. If we are true children, the great object of the Government ought to be to treat us as a guardian and see that we are always friendly and that we should always share the responsibilities and difficulties of Britain. We will do that, but not under the existing circumstances. That is impossible. It can be under one circumstance and one circumstance alone—when we are treated like children, equally and fairly. We have tried our best to abide by the desire of Government and are always ready to fight for them and I think it is the duty of Government to tell us, you are children and we remove all disabilities pressing against you. I do not mean this alone, there are many others. With these remarks I commend the proposition to you.

The resolution was then put to the vote and carried unanimously.

The Sixth Resolution. Railway Rates on Goods.

Dewan Bahadur AMBALAL SAKERLAL DESAI (*Ahmedabad*), who was greeted with applause, in moving the next resolution said :—

The proposition which I am desired to move runs as follows :—

‘That this Conference calls the attention of the Government to the prevailing complaints about existing railway rates and suggests that an enquiry should be instituted into their effect on indigenous industries, especially in their competition with imported goods, and further submits that the rates should be reduced where their effect may be proved to be injurious.’

The question of railways is a very important one from various points of view—from the political point of view, economic point of view, social point of view ; but the proposition now before us is a very narrow one. It is a proposition of what has been called ‘business economics.’ Throughout all these resolutions we have dwelt upon what we may say of a general character. As the Industrial Conference grows it may go into particulars. First we say, let us have a bureau of information, a department which will teach us and guide us in our industrial work ; then we say, let us be taught the technics ; then we say, let our agriculturists be freed from debt. These are the general ones—but this is a proposition of business economics.

There are many gentlemen here, who, I am sure, have studied political economy. They know the term, ‘cost of production’. The cost of production in this age of competition determines the success of all business. Now in the case of production, people are apt to think that if we can make an article, and of good quality, it is enough. But business men will tell you, it is not enough, the cost of carriage, the cost of transport generally, enters into the cost of production. It is the railway and the steam-ship that help all industries. How did Japan become great—because it sends students to Europe in thousands to learn industries. That is true no doubt, but there is another truth which all people do not know but which men in

business know—Japan subsidises her marine and Japanese articles are brought to Bombay at practically no cost, that is why Japanese hosiery has been killing Bombay hosiery. And the same is the case with Germany. You know the system of Cartels—they sell the articles dear in their country and save something and with that money subsidise steamers which carry their articles cheaply to foreign countries and in that way kill foreign industries. Now the proposition before us does not relate to the marine. This is as to land carriage. It is a common complaint that the rates charged by railways are very high. At one time, when there was plenty of coal in Bengal, Bombay could not use it, Bombay could use only dear fuel. Coal companies complained and Bombay factories complained and after a long time Government came to see that it was to the advantage of both to reduce railway rates for coal and the result has been advantageous to both. In the same way, what we ask now is that the rates on the railways should be thoroughly inquired into. It may be said that theoretically it is all well that the cost should be reduced, but where is the case proved that our industries have actually suffered? Many of you have, perhaps, read the report by Mr. A. C. Chatterjee, a Bengali Civilian, on the industries of the United Provinces. He says at the end that the great difficulty is the cost of railway carriage and that the sugar made in those provinces cannot be taken to the other parts of the country with a fair margin of profit. That is one. There is another, Sir Frederick Lely, a Chief Commissioner (he was a big Government official) in his book *Suggestions for the Better Governing of India*—says that the railway rates actually prohibit the growth of Indian industry—that is authority number two. There is a higher authority still. You may remember that the Government of India engaged the services of one Mr. Robertson from America and had the railway system examined by him. He has issued an excellent report which I feel sure most of you have read. There, Mr.

Robertson, the Commissioner, appointed by Government says that the railway rates in India are four times higher than they ought to be. These are the reasons that have induced me to place this proposition before you. It may be you produce articles of the requisite quality, but if they are made in Madras they can be sold only in Madras, they cannot be taken to Bombay, because of the heavy railway rates. In the North-West I have seen nice scissors and very good steel tools made, but these are of no use, because they cannot be taken from one part to the other without loss—the railway rates come in the way. Therefore I move for your adoption this proposition. (*Cheers.*)

Rao Bahadur DEORAO VINAYAK (*Akola*) in seconding the resolution said :—

Mr. President and Gentlemen, I am very thankful that my business is very short. I have to second the resolution put before you by our very able friend Dewan Bahadur Ambalal Sakeral Desai. He has left nothing for me to say. Our resolution is not like other resolutions where we ask of Government for something definite—we here want Government to enquire into the matter thoroughly and to find out if the present rates are in any way injurious to our industries. As to that we might give any amount of evidence. There are instances of unfair rates being levied and I am in a position to cite many such but I think it will be an unnecessary infliction upon you to go on with them at present. What we ask by this resolution is a very simple thing. The Conference calls the attention of the Government to the prevailing complaints as to existing railway rates and suggests an enquiry into the matter. We ask for enquiry only and I hope you will pass the resolution without any further remarks from me. (*Cheers.*)

The resolution was then put to the vote and carried unanimously.

The Seventh Resolution. Mining, Weaving and Sugar Industries.

The Honourable Sir VITHALDAS DAMODHER THACKERSEY, *Kt.*, (*Bombay*) moved the seventh resolution which ran as follows :—

‘That while expressing its satisfaction at the steady progress of the Swadeshi movement, this Conference concurring with the last Conference, calls the particular attention of capitalists and the general public to the necessity of developing the Mining, Weaving and Sugar industries, and urges the formation of Joint Stock Companies for working mines and erecting mills and factories.’

Sir VITHALDAS, who was received with cheers, said :—

Mr. President and Gentlemen,—Out of the eight propositions that are placed before you to-day, I find the first six deal with requests to Government to do one thing or another. Now in this proposition I am asking you to do what we ought to do. In this resolution special stress is laid upon Mining, Weaving and Sugar industries. I can say a little about Mining from my own personal experience. I can realise that when a Conference like this makes any recommendation or asks the public to follow its recommendations, it takes a great responsibility. Now, we must all know that Mining is a very risky and speculative business and although we all desire that the profits of mineral production should remain with us as much as possible, at the same time we must realise that we cannot take up those things at once, I mean, on a very large scale.

The first difficulty in Mining in India is the want of Indian experts. That, of course, we are going to meet by asking the Government to give us Mining Colleges. But until there is a very large number of men amongst us who are experts it is likely that we should be misled in our enthusiasm. For 999 men that have lost their fortunes in Mining only one has made his. So, if we go into Mining at all we should go only with a portion of our savings and not with the whole of our savings. (Laughter.)

As regards Weaving, so much has been talked of

Weaving in recent years that I will not take up your time to-day by asking you to support the Weaving industry of India.

The third point is about Sugar. There also, by the energetic action of the several Provincial Governments---of the United Provinces and Bombay Governments in particular, we know more about the Sugar industry now than we knew perhaps three years ago. Those who would like to go in for the Sugar industry have many opportunities to get sufficient information for taking up that kind of business.

The last recommendation in this resolution is the formation of joint stock companies. With our great enthusiasm we have been led away to form perhaps some joint stock companies that should never have been formed. This statement is the result of my observation and I should like to be frank with you to-day on this point. We know that in these days of huge capital and keen competition only large companies can succeed and stand against competition and, therefore, it is necessary that joint stock companies should be formed and that we should have manufactures on a large scale so that we might compete against foreign manufacturers. In India we have few men with huge capital but have a large number with small capital and, therefore, the system of joint stock companies is an ideal one for our progress. But when I say this, I feel inclined to utter a word of warning. I do not wish to give particular instances but I have been very much amused during the last two or three years to read several prospectuses of joint stock companies. When an individual takes to a certain business he wants to know how much profit it is likely to make. He does not start with the idea, 'we are Swadeshi and so we must lose our money.' But he carefully estimates his profits and tries to find out what difficulties he has to and can overcome. In several prospectuses that I have read, appeal is made to enthusiasm, we are told that we should be Swadeshists

but there is nothing said about the profits and on what basis this estimate is made. I am not speaking with the idea of condemning anybody, but I have here in my hand a kind of prospectus. No figures are given as to the estimate of profits.* I have no word to say against this particular Company. But I can say with due deference to those who have drawn up this prospectus that the public who want to put their small savings do not want such appeals to enthusiasm: they want to know what profit they can be expected to receive if they invest in a particular concern their money which in some cases may be a whole life's savings kept for one's old age. Swadeshism does not consist in pouring money into bottomless holes. (Hear, hear.) Swadeshism consists in making more and more money, increasing the prosperity of India and supplying Indian goods in place of foreign goods. (Applause.) Speaking about joint stock companies I have already pointed out that it is very necessary that we should have them in order to compete against the huge capitalists of foreign countries. Only the other day we are told of the case in America of the Standard Oil Company that made 16 millions on a paid up capital of ten millions. In the same way in England and on the Continent all the manufactures are conducted on a large scale. Therefore

* The speaker here read a paragraph from the Prospectus which ran as follows:—'Consider that this is *our first great united undertaking in Navigation*. Madras has already invested about 4½ lacs of rupees. Bombay and Bengal about Rs. 75,000, our countrymen in Ceylon nearly as much, and those in Burma, Africa, etc., over a lac and a half. The Company is no longer of a merely local importance. It has become *an all-India concern*. *Its failure will be a National disaster*, a block in the way of all future National enterprise. *Its success*, on the other hand, will be a sure foundation for National prosperity. Depend upon it, sir, it will be *an achievement of the greatest magnitude*. It is for you, Sir, to consider and choose. Do you choose to support and strengthen your own countrymen, or will you by your apathy and indifference throw in your lot against them? Do you choose to prevent or assist exploitation from our country? Choose, Sir, choose and act, choose the better of the two courses, choose nobly and well, choose with a keen eye into the future, and act promptly.'

we must have joint stock companies. But investors have to find out what profits will be made out of them. We have to be very careful before we put our money in them to know who are the Directors on the Board—whether they are Directors of responsibility or Directors of enthusiasm, whether the Company is to be conducted for the profit and for the good of the shareholders or for the profit of the Agents. Well, these are the questions that ought to be put and we must be satisfied that the Board is composed of responsible men. Circumstances might arise when we might lose—we cannot help it—, but we must be able to calculate that it will be conducted on an honest basis and with responsibility. There is a little difference between the system of forming joint stock companies in India and European countries. These companies so far as the Banking line is concerned must be formed—and on a large scale. It is only by starting on a large scale that we can inspire confidence in the public and get any deposits from them. I need hardly say that the main profit of a Bank is realised from the profits on deposits, the larger the deposits are in proportion to its capital the better for its shareholders. But for other manufactures, in Europe, in many cases, an individual either goes on with his own money or in conjunction with a few friends. They prove the success of the concern and afterwards convert the same into joint stock companies showing the actual figures of the previous three or four years. They would then get a strong board and float the Company and the investing public have the previous year's work to examine. But in India things are different. During the last two or three years when we have found the majority of people awakening from their state of lethargy and desiring to help on the industrial regeneration of India ; and when we have watched this most laudable spirit with great satisfaction, we have also found with great regret individuals taking mean advantage of this awakening. How often have we seen individuals going about and requesting wealthy citizens to

join the Board of Directors to start certain manufacturing industries? No question is put as to their utility or the experience of the individual who proposes to start the Company in the particular industry. It is quite sufficient for him in India to argue that it is a new industry, that it is Swadeshism and that therefore it must be supported. In that way, if he is successful in getting half a dozen wealthy men to join the Board with himself as a Managing Agent, he goes to the public for subscription of shares. If any joint stock company were to be started in Europe on this basis, I am sure not a single share-holder would put his money in it. The Board must be composed of experienced men, or in any case of sound and respectable men with a Managing Agent who can lay claim to practical experience in the line of business.

Well, Gentlemen, these are my ideas on forming joint stock companies and as I have taken the responsibility of asking you to form joint stock companies, I have considered it my duty to make this recommendation with the qualifications I have placed before you and I hope you will carry this resolution. (*Loud Cheers.*)

Mr. G. SUBRAMANIA IYER (*Madras*), whose rising was the signal for enthusiastic applause, in seconding the proposition said :—

Mr. President and Gentlemen,—I am very glad to second this resolution. You will observe that these three industries have been singled out to form the subject of one resolution, because they possess special importance and are among the most fruitful industries in the country. As regards Weaving, I need not say that it is almost as important as agriculture. Food and clothing are the two natural requirements of man and every man that wants food wants also clothing. Therefore weaving is as important as agriculture, and in this country as old as agriculture. Fortunately, Gentlemen, the industry of weaving is rousing itself from its torpor, it shows signs of stirring, and I have no doubt that in a short time the hand-loom

industry, at all events in Southern India, will reach a dimension and a status worthy of its position in the economy of the country. It is a simple industry, an industry which people understand, it does not require much capital, it does not require any special or elaborate training. Therefore you see in every part of India, and I may speak with special reference to Southern India, not only the old weaving classes who are beginning to see signs of hope, but the other classes too are taking active, intelligent interest to try to push this weaving industry forward.

Next, Sugar manufacture is mentioned in this resolution. India imports large quantities of manufactured sugar, crores in value every year, and sugar being a very important article of food to our people, its consumption must be in proportion to the population. Fortunately, it also happens to be an industry which does not require much elaborate preliminary training or very large capital. It has also begun to show signs of revival. In Northern India special efforts are being made to bring it up and to pursue it on Western lines. Government are taking special interest in developing it. The people too are forward—they are animated by a most wholesome desire to consume the indigenous article in preference to the foreign. I have no doubt, therefore, that in all parts of India where the raw material is so abundant, the sugar industry will thrive and meet the wants of the people and arrest the import of bounty-fed foreign sugar.

With regard to Mining, great difficulties rise in view—it is a very difficult industry, and as our distinguished friend has just observed, it requires enormous capital and very elaborate training. Practically our people have had no experience of that industry except what they have learned from our ancestors of former times, who, in a poor indigenous way exploited these mines. But, Gentlemen, there is no doubt that there is enormous mineral wealth in the country and it bodes evil to us unless we learn to come forward and work it for our

own benefit. Remember, Gentlemen, Mining is not like agriculture. In agriculture you have only to manure the soil and the soil yields year after year abundant harvest in proportion to the effort and intelligence applied. But in mining what happens? You cannot manure the mines so that they may yield year after year a fresh outturn. The mineral wealth is bodily transported by the exploiters and in 20 years the mines would be exhausted of their contents and for the next generation and for our children's children, these mines would consist of nothing but broken pots and charcoal. It behoves us, therefore, to conserve at least a portion of this our enormous natural wealth for our own children. Of course special training is necessary and we look to Government to give it to us. And as for the very large capital required, so far as we in Southern India are concerned, we can do little. The hope lies in Western and North-Western India, perhaps in Bengal too. We must not run away with the idea that there is no capital in this country, there is plenty of it. Only the other day I read, that the capital of private bankers in all India amounted to one hundred crores—I do not know whether it is true, but it is a statement made by an expert. If private bankers have for the purposes of lending one hundred crores, it remains only for the well-wishers of the country to organise this large indigenous capital and divert it into channels which will produce the greatest benefit to the country. There is besides any amount of capital lying idle in an immobile state or wasted. These enormous small atoms, wasted or rusting, have only to be gathered together, imparted life and converted into movable capital. Perhaps by the time we do these things almost all the mines will be depleted. But, however, there is no excuse for our being idle. Let us do our best—and I do not know if it is altogether a bad idea for a friend like Sir Vithaldas Thackersey to get up an organisation of the capitalists of different parts of the country and make them think how

they can best utilise the capital in such large and profitable industries as mining.

Before I conclude, I will refer to one portion of Sir Vithaldas's speech. I am very sorry that he referred to the Swadeshi Steam Navigation Company, Tuticorin, in the terms he did. The gentlemen that issued the appeal asked for a blessing and he has given a curse. That appeal was not intended to give data and figures to the public. The gentlemen who circulated this appeal thought, wisely or otherwise, that on this occasion which has brought together a large number of well-to-do patriotic gentlemen, an appeal to their love of their country and their interest in its industries might produce some effect so far as that enterprise went. Whether those gentlemen were well or ill-advised in so doing, I say this, that I entirely dissent from Sir Vithaldas that Swadeshim has nothing to do with enthusiasm. I would appeal to him if in the several enterprises he has helped he has divorced himself from enthusiasm. I do not know if there is any country where trade is altogether on money lines, altogether divorced from patriotism and enthusiasm. Nor is it improper of the Swadeshi movement to ally itself with these qualities. It is all very well for people in Bombay who command their millions to talk of money and business. But for us less important mortals here, people with little money and much spirit, enthusiasm and patriotism are our allies. Therefore, Gentlemen, I am very sorry that such a good friend of Indian industry, a friend to whom I may say industry in Western India is so much indebted, should have spoken in the terms he did. I hope it is only a passing sentiment and it will yet be the good fortune of the Company to enlist the enthusiastic and patriotic friendship of Sir Vithaldas Thackersey. (*Cheers.*) I may add that it is not for our friends of Western India to cavil at enthusiasm or patriotism, because but for that enthusiasm and patriotism with which the people of Bengal and other parts of India, in pursuit of the Swadeshi spirit, rushed

at their mills for indigenous articles they would not have made their piles of profit and invested them in fresh mills in view to fresh profits.

About amateur Directors, I will say this—men are not born business Directors. I dare say the third generation of ancestors of Sir Vithaldas were amateur Directors before their successors developed, from failures and successes by turns, to be business Directors. After all, failure is not a thing to be ridiculed—failures teach as many lessons as successes. Aye, because we have been too afraid of failures, we have not had more successes. So, what is the harm if people fail and prove bad Directors?

I will not detain you any longer. There is not much mining industry in Southern India, but that is no reason why our young men should not respond to the appeal just made and join the Sibpur Engineering College to study that industry. (*Loud cheers.*)

The Honourable Mr. H. S. DIKSHIT (*Bombay*) in supporting the resolution said :—

Mr. President and Gentlemen,—I have great pleasure in supporting the proposition which has been so ably placed before you and seconded by your esteemed townsman, Mr. G. Subramania Iyer. Both of them have exhausted the subject and I do not think I shall be justified in taking up your time in going over the same ground again. Of course their speeches have had additional interest attached by reason of certain controversial remarks that fell from Sir Vithaldas Thackersey and controverted by Mr. Subramania Iyer. I suppose—if I may be permitted to add a remark—I do not think Sir Vithaldas intended to run down patriotism. He said patriotism should be combined with business principles. Nothing must be put forward on patriotic grounds only, it is the business principle that ought to predominate in every business concern, because if one such new project resulted in loss several similar projects may find it difficult to be floated, and I believe it was with that view he cautioned people. I

suppose Sir Vithaldas would be the first to patronise and support all these institutions founded on business principles, but he would insist, and wisely, that business principles should be brought into them.

You will observe, Gentlemen, that the resolution is one which is simply a reiteration of a resolution we have already passed—that is one more reason why I think I should not advance any argument in favour of it. The necessity for developing these industries still remains. In proof of that I need only refer you to the figures of imports which were given here yesterday, perhaps in the speech of the President, and also in the able paper which Professor Kale placed before you. The imports of textile fabrics came to something like 44 crores, mineral products 19 crores, imports for sugar to 10½ crores and it is strange that with the Swadeshi movement the imports of sugar should have gone on increasing. These figures are quite enough justification to make redoubled efforts. Of course, last year, certain efforts were made—20 cotton mills were established with a large capital, also two sugar factories, but that is very little compared with what remains still to be done. I am sure you will have no difficulty in accepting the proposition that has been placed before you. (*Cheers.*)

Before putting the Seventh Proposition to the vote the PRESIDENT said :

I did not think, Gentlemen, when this proposition was placed before you, that there would arise any occasion for me to address any words to you about it. But in the course of it certain developments came about that make it necessary that I should speak. Some remarks of Sir Vithaldas have been warmly criticised by our friend, Mr. G. Subramania Iyer, who followed him and there seems to be an impression that the two gentlemen who have spoken on the resolution hold divergent views. I therefore think it necessary to point out to you that there is considerable amount of truth that exists in the speeches of both my friends. There is, I am sure, no man here who does not

believe in the value of sentiment—I am myself a thorough believer in sentiment—man, I know, is moved more by sentiment than even by selfish interest. At the same time what my friend, Sir Vithaldas said is this—it is quite true you have to fight against odds and you must be actuated by the sentiment of patriotism. At the same time you must remember that you can establish your position only if you work on solid ground. Therefore, without meaning to run down an institution like the Swadeshi Steam Navigation Company, he said, here is a thing with regard to which you have to attract people not by appeals but by facts, and I am quite sure, knowing as we do what Sir Vithaldas and his father and grandfather have been doing for the industries of India, we can certainly say he did not at all mean to run down the institution he referred to. Gentlemen, I had to speak in my address yesterday with regard to a number of things and in the hurry of the moment I forgot to make allusion to one thing which is being done under very great difficulty in this Presidency—I refer to the Tuticorin Swadeshi Steam Navigation Company. At present it is under difficulties. It is the duty of the whole country to lend a helping hand to it. At the same time we must insist on the strict application of business principles to an institution of such a character. I shall tell you what I mean by business principles—put your most honest men and your most competent men in charge of the work, raise the requisite money, secure the requisite knowledge and insist upon regular, methodical strenuous work. The concern is one which ought to be paying if it is conducted on business principles. Have your high impulses, work them up on business lines, and you will succeed. I hope you will now see that there is no vital difference between what Sir Vithaldas said and what Mr. G. Subramania Iyer said. (*Cheers.*)

The proposition was carried by acclamation.

**The Eighth Resolution. Office-Bearers and Funds
for the year 1909.**

THE CHAIRMAN OF THE COMMITTEE then called upon Mr. N. SUBBA RAO PANTULU (*Rajahmundry*) to move the next resolution which ran as follows :—

‘ That this Conference re-appoints Rao Bahadur R. N. Mudholkar as General Secretary and Mr. C. Y. Chintamani as Assistant Secretary and appeals to the public for a sum of Rs. 5,000 for meeting the expenses for the next twelve months.’

In moving the proposition Mr. SUBBA RAO PANTULU said :—

Mr. President and Gentlemen,—We have passed a number of resolutions and it is necessary that we should take some steps that our work in the coming year may be carried on as efficiently and as well as it has been done this year. This Conference is not like other bodies which sit for three days and finish their work (*Cheers.*) Our work goes on continuously from day to day throughout the year and for that purpose we have to appoint a General Secretary and an Assistant Secretary. It is hardly necessary for me to commend to you the name of our worthy President, Rao Bahadur R. N. Mudholkar, who has been giving his best energy and time to our work and to the cause of the country. (*Cheers.*) As for the Assistant Secretary I need hardly mention to you that we cannot get a better man than Mr. Chintamani. (*Cheers.*) In spite of ill-health, he has been touring all over India visiting important centres and gathering information for the Industrial Conference. The report that has been published bears ample testimony to the vast amount of work done by the Assistant Secretary. (*Cheers.*) I wish every one of you present and all your friends who have not been able to come here will take the trouble of going through this report and realise the vast amount of work done during the year in the cause of the industrial regeneration of the country. It is a mine of information of the work done in different parts of the country including the Native States, it details the various steps taken by the Government and by the people. I beg of you therefore to read this report as it will give us a fresh

	RS.
The Honourable Mr. B. N. Sarma, Vizagapatam ...	25
K. Perraju, Esq., Cocanada ...	25
R. V. Mahajani, Esq., Akola ...	25
R. G. Mundle, Esq., Yeotmal ...	25
N. M. Bedarkar, Esq., Amraoti ...	25
Chunilal M. Gaudhi, Esq., Surat ...	25
Rao Bahadur Khaudubhai G. Desai, Surat ...	25
Rao Bahadur V. K. Ramanujachariar, Kumbakonam ...	25
T. Rangachariar, Esq., Madras ...	25
Messrs. Mathuradas Ramchand Jhaveri and Rao Bahadur Hiranand Khemsingh Advani, Hyderabad (Sind) ...	25
T. A. Narasimbachariar, Esq., Krishnagiri ...	25
R. Shadagopachariar, Esq., Madras ...	25
Pandit D. Gopalacharlu, Madras ...	25
T. V. Sanjiva Rao, Esq., Coimbatore ...	25
K. V. Rangaswami Iyengar, Esq., Srirangam ...	25
Vidya Sagar Pandya, Esq., Madras ...	25
Rao Bahadur G. Srinivasa Rao, Madura ...	25
M. R. Ramakrishna Iyer, Esq., Tinnevely ...	20
K. Narayana Sastriar, Esq., Coimbatore ...	20
T. A. Ramalingam, Esq., Tirupur ...	20
Harchandrai Vishindas Bhavani, Esq., Karachi ...	20
Mulshi Ganga Prasad Varma, Lucknow ...	15
The Honourable Mr. M. Krishnan Nair, Calicut ...	15
Dewan Bahadur P. Rajaratnam Mudaliar, C.I.E., Madras.	10
R. A. Deshpande, Esq., Amraoti ...	10
D. G. Dalvi, Esq., Bombay ...	10
Lala Dharam Das Suri, Lahore ...	10
Rao Saheb N. Subbarao, Mangalore ...	10
P. V. Vasudevarao, Esq., Madras ...	10
N. Krishnaswami Iyengar, Esq., Kumbakonam ...	10
The South Indian Mills Co., Ltd., Tinnevely ...	10
G. Subramania Iyer, Esq., Madras ...	5
K. V. Srinivasa Iyer, Esq., Coimbatore ...	5
P. Narayana Menon, Esq., Calicut ...	5
K. R. Venkatarama Iyer, Esq., Tuticorin ...	5
P. N. Raman Pillai, Esq., Madras ...	5
	<hr/> 3,055

The total up-to-date is about Rs. 3,000. All of us cannot subscribe as much as some of the gentlemen whose names I have read, but every one of us can subscribe something and I request every one of you before you leave this Pandal to put down your names for whatever you may think fit. I may mention that for want of funds the General

Secretary was not able to appoint last year another Assistant Secretary, an office secretary to do work in the office. He needs two Secretaries, one to go round India and another to do office work. With funds coming he hopes to be able to appoint another Secretary so that better work may be carried on in the coming year.

With these words I commend the proposition to you.
(*Cheers.*)

Munshi GANGA PRASAD VARMA (*Lucknow*) in seconding the resolution said :—

I have great pleasure in seconding the proposition. The best way in which you can support it is by every one of you subscribing your mite to the Industrial work of the country. (*Cheers.*)

The proposition was put to the vote by the Chairman of the Committee and carried by acclamation.

Vote of Thanks to the President.

Rao Bahadur M. ADINARAYANA IYAH (*Madras*) in proposing a vote of thanks to the President, said :—

Gentlemen,—It is my pleasant duty to propose a vote of thanks to our honoured President, Rao Bahadur R. N. Mudholkar. (*Cheers.*) I am told that this Conference has been a great success, a greater success than the Conferences of the preceding years. (*Hear, hear.*) Whatever other causes may have contributed to that success I certainly think it is due in no small degree to the strong personality and eminent qualifications of our honoured President. (*Cheers.*) The firm and sagacious guidance he has given to our deliberations both in the Subjects Committee and on this platform here have enabled us to arrive at some definite conclusions on some of the very important Industrial questions affecting our country. Not on this occasion and on this platform only, but from year's beginning to year's end for some considerable time past, has he laboured assiduously to educate the thought and focus the attention of the people on the economic needs of the country. (*Cheers.*) And his labours, ably seconded by our untiring friend

Mr. C. Y. Chintamani (*cheers*,) have succeeded in bringing together a mass of valuable information which is made available to all of us in the very useful annual reports and directories issued under their editorship. It is undeniable, Gentlemen, that the country has recently been passing through a period of stress, call it unrest or discontent as you like, but the point to remember is that this phenomenon of stress has its root in the economic condition of the people—as has been so clearly expounded by our worthy President. We have been trying to apply remedies from various points of view but the most effective solution must, there can be no doubt, come from the amelioration of the economic lot of our people. It is fortunate in this connection that the highly statesmanlike and generous proposals for the betterment of the political status of the people recently announced by Lord Morley will allay to a great extent the anxiety felt by our people and we can confidently expect that much of the somewhat disproportionately large attention given hitherto to the consideration of political questions will be diverted to the solution of our economic questions, of which the industrial aspect is perhaps the most important. As I have already said Rao Bahadur Mudholkar, our honoured President, has rendered yeoman service in pressing upon us the need for earnest action in this respect and has striven hard to furnish us with materials for guiding our steps in the right direction. I need hardly say that the vote of thanks which I ask you to pass with acclamation has been abundantly earned by him. (*Loud cheers*.)

The Honourable Sir VITHALDAS D. THACKERSEY (*Bombay*) in seconding the proposition, said :—

Gentlemen,—Before I proceed to second the resolution which has been so ably placed before you I should like to clear up a misunderstanding. I am told that the effect of my earlier speech was to discourage you from assisting the Swadeshi Steam Navigation Company. I can frankly tell you that was far from my mind, and I acknowledge that

the promoters of the Steam Navigation Company have gone on with great enthusiasm and made great sacrifices (*cheers*). Not only those who have organised the movement but those hundreds of merchants who have undertaken to ship goods through that Steam Navigation Company have also made a sacrifice and taken a great step, and believe me, Gentlemen, I would be the last person to discourage an institution like that which has done so much for us. (*Cheers*.) My object in reading the paragraph from that prospectus was to point out to you in what way the prospectuses of the present day were issued and it was only as an example that I read it to you. I assure you, Gentlemen, that I did not read that paragraph in order to depreciate the work of that Company. I am now informed that there is a booth of the Swadeshi Company in this compound where all the accounts are kept to satisfy the investing public that it is a good concern and I hope that each and every one of you who desires to take shares will examine the accounts and satisfy yourselves about the prospects of the Company. I may tell you that in this we have a greater duty to perform than with regard to a new Company. One that has already been formed must, if possible, be made to stand on its legs,—any existing Company that is sent into liquidation will discourage the formation of a hundred more Companies. (*Hear, hear.*)

Now coming to the subject-matter of the resolution, you are all aware that Rao Bahadur Mudholkar has done a great service to us. We are not thanking him only because he is our President to-day but he has for years past done our General Secretary's work which is a hundred times, a thousand times, heavier than what falls upon a President of the Conference for two days. His regular and continuous work for the sake of the country deserves our best thanks and we are doing no more than our duty when we carry this resolution of thanks to our President. As President he has discharged his duties with great credit to himself and great credit to the Industrial Conference

and I am sure you will carry this resolution with acclamation. (*Loud cheers.*)

The Chairman of the Committee put the proposition to the vote and it was carried with great enthusiasm.

The President's Concluding Speech.

The PRESIDENT, who was received with warm applause, said in closing the Conference :—

Gentlemen, Friends and Countrymen,—I belong to a profession which is derisively called the spouting profession. In that profession I never feel any hesitation to rush into the midst of an argument. But there are occasions on which, a working lawyer though I am, I feel a kind of nervousness coming upon me when I have to address even my brethren and countrymen. The words, the highly flattering, the highly appreciative words in which two of my friends have kindly spoken of me, one of them a veteran in years, a veteran in work, a man who has done solid work for well nigh 40 years—when he speaks in such words of high encomium, when I find my friend Sir Vithaldas, who has been a very hard-working man speak in that kind of language about me, and when I find you receiving their words with prolonged applause, I confess to you, I do not find words to express my gratitude to you and the feeling I entertain for your kindness. Gentlemen, I am doing the little that is in my power to do, because I feel a kind of call of duty which leads me to it. (*Cheers.*) If in the performance of that my countrymen's praise comes to me it would be affectation not to say that it is most pleasing to me—it would be more than human, it would be utterly ungrateful, and utterly unworthy of a man to deny it. I therefore admit that while your kind commendation has given me pleasure it has all the same increased the burden of the weight which I feel. I am very grateful to you for the kind vote of thanks which you have passed. Gentlemen, we all of us owe a great duty which we cannot repay in one life to our countrymen and to the land which has given us birth, a land in which the ashes of our forefathers lie, and

in which our own ashes will lie hereafter. That land is at present not basking in the sunshine of glory. The descendants of the Rishis and of the prophets are in a very low condition, fallen from their once high estate. And as the true sons of that India it is our duty to devote our life and to render all the service that lies in our power for raising it to the highest position. As sons of India I call upon you, as brothers I call upon you with all the strength I have, to lay aside the differences which have unfortunately arisen during the last year or two, and to work with one heart and with one soul for the elevation of the country which is so dear to us. Gentlemen, it is hard enough that the Hindus have got innumerable sections and sub-sections which on account of various circumstances cannot at times co-operate. It is hard enough that there should be the permanently standing question of Mahomedans and Hindus. I say let there be no further differences. Though there may be and ought to be varieties and shades of opinion upon political questions, upon religious and social questions, let us all so conduct ourselves as to remember that all of us have to co-operate with each other, must have the help of each other, in carrying on the nation's work and in trying to raise our country to its pristine glory. Gentlemen, I said yesterday that our fate lies in our hands. Remember you have a high duty placed upon you. We are not here in this world only for the purpose of securing all benefits to ourselves. We are not here for the purpose of laying by everything for our families, we are not for the purpose of securing rewards for ourselves, our relations and friends. There is a higher purpose in our existence. You worthy sons of Indian Rishis, you who are the sons of the prophets, you know there is a call of duty upon you, you must remember that unless there is more earnestness, unless there is more steadfast work, unless there is greater devotion to duty our fate will never be altered. I speak with feeling in this matter, because I have unfortunately seen a tendency to treat—what shall I say?—with levity? No, I shall say, without sufficient considera-

tion, the high duty which lies upon our people. Sometime ago I read in one of your Madras dailies—the *Indian Patriot*—a description of the life of certain educated men in a certain mofussil town. It showed how after doing the day's Court or *Kacheri* work, the afternoons and evenings are passed in playing cards and doing other frivolous things and how till a late hour in the night everybody is busy with it. Well, gentlemen the state of things depicted is not peculiar to this Presidency or to the particular town. I do not ask young men to give up all amusement and recreation. But let them remember that there is a higher purpose in life than making money and indulging in pleasures. Let them ever bear in mind that the future of the country depends upon them. The old men cannot be expected to continue long and after all it is on the future generation, it is on the virility of youth that the progress of a country depends. You my young countrymen, therefore, have a great but at the same time a hard task before you and unless you bear in mind that nothing but strenuous exertion, nothing but sacrifice will avail us, you will have done nothing for the regeneration of the country. (*Cheers.*) Gentlemen, if by the applause with which you have received me you give the assurance that you bear in mind just the few words I have addressed you upon the subject you will have done me far greater honour than by organising a demonstration in any other way.

Gentlemen, having said this much to express my gratitude to you, there is a duty to which I have to address myself, to perform both on account of yourselves and myself—that is, to thank the gentlemen who have been so successfully and with such devotion working for us. I have to offer on behalf of you all our grateful thanks to our friend, our worthy Chairman Dewan Bahadur P. Rajarathna Mudaliar, to our Secretaries Mr. N. Pattabhirama Rao and Mr. P. Lakshminarasu Naidu, and to the other members of the Committee of the Conference for the very great trouble they have taken for promoting this Conference. (*Cheers.*)

Along with them I wish to associate the members of the Reception Committee of the Congress for the courtesy and kindness with which they placed the Congress Pandal at our disposal and for the special trouble they took on our account for having the preparations pushed on to make the pandal available to us. To the Secretaries and especially to Mr. A. S. Balasubrahmani Aiyar our thanks are due for this. Their work was not connected with our organisation. But on many occasions our wishes had only to be mentioned to know that they had been already anticipated and our wants had been already arranged for. I am, therefore, gentlemen, very grateful to them, as grateful to the Congress Reception Committee as to ours, for all the work they have done for us. And to the gentlemen of the new corps that has been founded, to the Captain, to the Lieutenants and to the Volunteers we must similarly express our deep obligations for the assistance rendered to us and for the help so cheerfully given to us. They are men who in life occupy as high a position as any of us here and yet they have undertaken to serve us. And our best thanks are due to them. We have also to express our thanks to their Excellencies Sir Arthur and Lady Lawley (*cheers*) for their gracious kindness in attending our Conference. By their presence they have practically demonstrated the sympathy they feel not only with the Industrial movement but with the people of this land. (*Cheers.*) Gentlemen, I have to thank my brother-delegates and you all for the very great trouble which you have taken in attending this Conference, in taking part in its deliberations and I therefore on behalf of the organisers of the Industrial Conference express my gratitude to you.

Gentlemen, this Conference must now come to an end. I hope next year we shall meet under even still better auspices, have a still more successful gathering and be able to advance the cause of the country still further. I now dissolve this session of the Indian Industrial Conference. (*Loud and prolonged cheers.*)

APPENDIX I.

(*Vide* PAPER BY MR. H. R. CROSTHWAITE on ' *Introduction to Co-operative Credit,*' pp. 93—115)

Bye-laws for a Rural Co-operative Credit Society in the Seborna Tahsil, Jubbulpore District, without capital and with unlimited liability.

1. This Society shall be called therural society. Its registered office is at.....

2. Any person of good character who resides in.....is qualified for admission to membership on his agreeing to pay an entrance fee of eight annas, and undertaking to free himself from all such pecuniary obligations as he may be under to any person or institution other than theco-operative credit society by the discharge, either from his own funds or from money obtained from the.....co-operative credit society, of all existing debts which he may owe to any person or institution other than the.....rural co-operative credit society and in addition all such persons undertake, on admission to membership, to refrain from borrowing money on any pretext whatsoever from any person or institution other than therural co-operative credit society after having been admitted to membership of the said society.

3. The members shall have the power by a majority of their total number to elect or reject an applicant for membership.

4. On election as a member an applicant shall sign his name in the register. If he cannot write, his thumb impression shall be taken. He shall at the same time pay his entrance fee.

5. Should a member fail to pay any instalment of his debt to the society as it falls due the Panchayat shall have the power to recover at once any amount which he may owe to the society and to remove his name from the list of members.

6. Every member shall be, equally with every other member jointly and severally, liable for all loans taken by the society; but each member shall be liable only for the loans incurred by the society before cessation of his membership. *Vide* Section 17 of the Act.

7. A member who owes no money to the society may withdraw from membership.

8. The Panchayat may, by vote of a majority of their total number, expel any member of the society :

(i) for being in default to the society for a period of one month after notice of the default has been given to him.

(ii) for conduct injurious to the credit and reputation of the society.

(iii) for a serious breach of the rules or of the bye-laws of the society.

9. Every member of the society whose connection with the society has ceased under byc law 5, 7 or 8 shall be liable for any debts which he may owe to the society. He shall also remain liable to contribute to the debts of the society as they stood at the time when he ceased to be a member in the event of the society being wound up within one year from the date of the cessation of his membership.

10. Until a Panchayat is elected by the members of the society, the signatories of the form of application for registration shall be deemed to be the Panchayat.

11. As soon, after registration, as convenient the members of the society shall meet and shall elect a Panchayat which shall consist of not less than three members.

12. No one who is not a member of the society shall be eligible to serve on the Panchayat.

13. The Panchayat shall be elected annually at the general meeting of the members. Any member of the Panchayat shall be eligible for re-election.

14. The Panchayat shall elect one of its members as Sarpanch.

15. The Panchayat shall meet as often as may be necessary, and in any case at intervals of not more than three months.

16. The powers and duties of the Panchayat shall be as follows:—

(i) To consider applications for loans and to grant or reject them.

(ii) Subject to the provisions of rule 20, clause III to raise loans and to disburse them.

(iii) To collect, as they fall due, the principal and interest of loans.

(iv) To examine all cases of outstanding arrears and to make such arrangements as may in such cases be necessary to provide against loss.

(v) To maintain the society's accounts and records.

17. The proceedings of meetings of the Panchayat and of the society shall be recorded in a Roznameha which shall be signed by the Sarpanch in token of accuracy.

18. No member of the Panchayat shall vote on any application for a loan in which he is himself interested as a borrower.

19. A general meeting of the society shall be called as often as may be necessary. At least one such meeting shall be called each year in the month of April. This meeting shall be known as the annual general meeting.

20. The members shall, in the annual general meetings:—

(i) Elect the Panchayat for the year.

(ii) Fix the maximum amount of credit to be allowed to any one of its members during the year.

(iii) Fix the maximum amount of liability to be incurred by raising loans on behalf of the society during the year.

21. On receipt of money the Panchayat shall distribute it to borrowers as soon as possible.

22. The rate of interest which members of the society shall pay for the loans which they take as individuals from the society shall be 12 per cent. per annum. Of this 12 per cent. not less than three per cent. shall be deposited in the Sehora Central Bank as the Reserve Fund of the society.

23. Every member of this society undertakes to contribute annually to the society's Reserve Fund a sum which shall not be less than the equivalent of one anna in each rupee of the annual rent payable by him on his holding in Mauza Simaria.

Such contribution to the property of the contributor and his heirs shall be subject to the bye-laws of the society. A non-agriculturist shall contribute such annual sum as may be determined upon his election as a member.

24. The Reserve Fund shall not be drawn upon without the sanction previously obtained of the Registrar of Co-operative Credit Societies, Central Provinces.

Bye-Laws of the Sehora Central Bank, Limited.

1. This society shall be called the Sehora Central Bank, Limited. Its registered office is at Sehora, and its bye-laws are to be considered as subject to the provisions of Act X of 1904.

2. The initial capital of this Bank shall consist of 205 ordinary shares of Rs. 10 each already guaranteed. The capital to be called up by equal demands on every share as scope for investment arises.

3. No share-holder is to hold more than 40 shares, provided that if the share capital of this Bank be augmented as hereinafter provided any shareholder may hold such number of shares as shall not exceed one-fifth of the whole number.

4. The capital of this Bank is to be employed solely in the grant of loans to village co-operative credit societies registered under Act X of 1904.

5. The total amount of credit to be allowed to any village society during the year is entirely a matter for the decision of the managing committee of the Central Bank.

6. The affairs of the Bank shall be managed by a Board of not less than five directors elected by the share-holders. They shall be elected by the share-holders annually and shall hold office for one year. Any director is eligible for re-election. The qualification for director shall be 20 shares.

7. In the event of a director dying or retiring during the term of his office, the other directors shall appoint a duly qualified share-holder to fill the vacancy for the remainder of the term.

8. The following officers shall be entitled to sit at the meetings of the Board, as a director :—

- (i) The Deputy Commissioner of the District.
- (ii) The Sub-Divisional Officer, of the Sehora Tabsil.
- (iii) Mr. H. R. Crosthwaite, Settlement Officer.

9. The chairman of the Board of Directors shall be elected at the annual general meeting of the members of the Bank. When the chairman so elected is not present at a meeting of the Board the directors present shall elect one of their number to preside at their meetings.

10. The Board of Directors shall have the following powers and duties :—

(i) To appoint a working committee of not less than three directors to conduct the routine business of the Bank.

(ii) To appoint, dismiss, suspend or otherwise punish any paid officers of the Bank or to dismiss or if necessary proceed against any officer of the Bank.

(iii) To accept deposits or to raise capital by the issue of new shares.

(iv) To purchase shares in the Bank on behalf of the Bank at their paid-up value.

(v) Each year in the month of July to call an annual general meeting of the Bank and to submit to it the annual report and balance sheet and statement of assets and liabilities of the Bank up to the previous 30th June.

(vi) To publish the annual balance sheet of the Bank.

(vii) To institute, conduct, defend, compromise, refer to arbitration or abandon legal proceedings and claims by or against the Bank or Board of Directors or officers concerning the affairs of the Bank.

(viii) Generally to conduct the business of the Bank.

11. The working committee shall consist of such number of directors as the directors themselves may appoint. The chairman of the Board of Directors shall have the right to preside over this committee and shall have a casting vote. The working committee shall have the following powers and duties, provided that not less than three directors shall form a quorum :—

(i) To sanction applications for the purchase of shares and to grant provisional admission to membership of the Bank. Provided that such grant of admission to membership be conditional on election by a majority of the members of the Bank duly assembled in the next general meeting. Provided further that not even provisional admission be granted until the would-be member has handed to the working committee a written declaration that he consents to be bound by the permission of this bye-law. Should any person provisionally admitted as a member fail to secure election, such monies as he may have paid into the Bank, shall be regarded as a deposit repayable one year after the general meeting in which the

failure to secure election has occurred together with interest thereon at the rate of 8 per cent. per annum.

(ii) To consider applications for loans or credits and to sanction or reject them.

(iii) To consider cases of overdue loans and pass orders thereon making such arrangements as may be necessary to provide against loss.

(iv) To fix the rate of interest on fixed deposits.

(v) To regulate the routine of the office.

(vi) To suspend any officer of the Bank pending consideration of the case by the Board of Directors.

(vii) To supervise the account of the Bank and to prescribe the forms to be used in accounts and registers and other books and documents of the Bank.

(viii) To prepare for submission to the Board of Directors such reports and statements of account as the Board of Directors may direct.

(ix) To perform any other duties which may be entrusted to the working committee by the Board of Directors.

12. The Board of Directors shall meet as often as may be necessary and in any case at intervals of not more than three months. A special meeting of the directors shall be held at any time when such a meeting shall be required by the directors in writing.

13. The working committee of the Board shall meet as often as the business of the Bank may require and in any case at intervals of not more than one month. A special meeting of the working committee shall be held at any time on the written requisition of two members of the committee.

14. Two-thirds of the total number of directors shall form a quorum for the purpose of a meeting of directors; provided that not less than three directors shall form a quorum.

15. The proceedings of each meeting of the Board of Directors and of the working committee shall be recorded in a minute book by the Secretary and shall be signed by the Chairman of the Board, or of the working committee as the case may be in token of correctness.

16. The Board of Directors shall appoint a Secretary of the Bank.

17. The duties of the Secretary shall be as follows :—

(i) To summon and attend all meetings of the directors, of the working committee and of the share-holders.

(ii) To record the proceedings of all such meetings in a minute book.

(iii) To sign on behalf of the Bank all receipts, deeds and instruments to which the Bank is a party, with the exception of share certificates, on which, besides the Secretary's signature, there shall be the signature of one of the members of the working committee of directors.

(iv) To conduct all correspondence on behalf of the Bank.

(v) To attend all meetings of the directors and of the working committee.

(vi) Generally to supervise the business of the Bank and to perform any duties which may be intrusted by the Board of Directors or by the working committee to him.

18. Any person may become a share-holder in the Bank subject to the provisions of bye-law 11-(i); provided that the vote of members assembled in general meeting shall be obtained on every application for membership. It is not within the competence of either the working committee or the Board of Directors to withhold any application for membership from the members of the Bank assembled in general meetings.

19. Every share-holder shall be entitled to one vote.

20. Every share-holder of more than five shares shall pay a fee of Re. 1 to the funds of the Bank.

21. The liability of share-holders shall be limited to the number and nominal value of their shares.

22. No shares shall be transferred except to the Bank or subject to the provisions of bye-law 3 to a member of the Bank who has already secured election to membership by vote of the members of the Bank assembled in a general meeting. No transfer of shares to the Bank can be accepted save by the members of the Bank assembled in general meeting.

23. The interest to be charged on loan shall be Re. 0-12-0 per cent per mensem.

24. The rate of interest on deposits shall, save as provided in bye-law 11 (i), be fixed by the working committee.

25. The working committee shall, save as provided in bye-law 11 (i), have the power to alter the rate of interest on deposits from time to time, but the rate of interest on an existing fixed deposit shall not be altered till the expiration of the term of such deposit.

26. Not less than 25 per cent. of the profits of the Bank shall be applied to the formation of a Reserve Fund.

27. The Reserve Fund shall be invested in Government paper or placed in the Post Office Savings Bank or deposited in fixed deposit with a joint stock or other Bank approved by the Registrar.

28. No amount shall be transferred from the Reserve Fund to meet any loss by bad debt or otherwise, except with the sanction of the share-holders assembled in general meeting, and the permission of the Registrar.

29. The dividend paid to share-holders shall in no year exceed 10 per cent. of the amount of the paid-up capital of the Bank until the maximum rate on loans to rural societies has been reduced to 6 per cent. per annum.

30. A general meeting of the share-holders of the Bank may be called as often as the Board of Directors shall deem necessary. At least one such meeting shall be called in the month of July in each year. This shall be known as the annual general meeting.

31. The Board of Directors shall, upon receipt of a requisition in writing signed by not less than ten share-holders, convene a general meeting of the Bank.

32. At least two weeks' notice shall be given to all share-holders before a general meeting is held.

33. A fourth of the share-holders including proxies shall form a quorum of a general meeting of the Bank, but this rule is not to render the provisions of any other rule nugatory.

34. All questions submitted for decision shall be decided by a majority of votes unless otherwise specially directed by the rules or bye-laws.

35. In the annual general meeting the Board of Directors shall submit to the share-holders the report, accounts and balance-sheet of the Bank for the year ending on the previous 30th June.

36. The shareholders shall in the annual general meetings : -

- (i) Elect the directors for the year.
- (ii) Consider the report, accounts and balance sheet.
- (iii) If profits admit, declare a dividend.
- (iv) Transact such other business as may be laid down before them by the directors.

37. Save as provided in Section 23 of the Co-operative Credit Societies Act, 1904, the Bank shall be wound up only with the sanction of the share-holders assembled in special meetings to consider the question of liquidation, and under the orders of the Registrar of Co-operative Credit Societies.

38. The above bye-laws can be amended by resolution of a general meeting of the Bank after sanction of the Registrar of Co-operative Credit Societies, Central Provinces.

FORM I.

SHARE REGISTER

No. of Shares.	Name of Purchaser	Address	Transferred to	Remarks
211	Gurdin Misra	Sihora	Ahmad Bux	See page 18 Vol II Share Register

DETAILS OF PAYMENTS

	Rs	AS	P
By call of May 9th 1907	5	..	..
By call of June 9th 1907	5	..	..

[illegible]

Name of Society.....

[illegible]

APPENDIX II.

THE

VICTORIA JUBILEE TECHNICAL INSTITUTE, BOMBAY

A Record of Twenty Years' Progress, 1887—1907.

BY RAMAKRISHNA M. CHONKAR, ESQ.,

Assistant Secretary, Victoria Jubilee Technical Institute, Bombay.

The record of the progress of the Institute since its establishment twenty years ago may fitly commence with some reference to the efforts which culminated in that achievement. At the close of the memorable Viceroyalty of the Marquis of Ripon, the citizens of Bombay raised a Fund to commemorate that nobleman's beneficent administration. It was felt that the Memorial should be worthy alike of the great Viceroy and of the First City in India. Over a lakh and a half of rupees were collected, and in view of the great interest evinced by the retiring Viceroy in the educational advancement of the country and the rapid growth of the industrial and commercial activities of Western India, the establishment in Bombay of an institution for Technical Education, was suggested as the most appropriate form the memorial could take. Accordingly the representatives of the Fund approached Sir James Fergusson, the then Governor of Bombay, in order to ascertain how far Government would be pleased to support the proposal. Sir James favoured the idea and it was understood that Government would, under certain conditions, grant the necessary land, and give a suitable annual contribution towards the maintenance of the proposed institution. Before, however, the negotiations assumed a definite form, Sir James had been succeeded in the Governorship by Lord Reay : and the representatives of the Ripon Memorial had to reopen their proposals. As these involved a departure in the educational system of the Presidency, Lord Reay deemed it desirable to ascertain the views of the leading citizens on the subject. Accordingly an informal meeting of a few leading citizens was held, on the 3rd September 1885, under the presidency of the Governor, at the Secretariat, for the discussion of the question of the advancement of the educational and commercial prosperity of Western India. The meeting agreed that the most crying want of the Presidency was Technical Education. Diverse suggestions were made as to the lines on which it should be introduced and Lord Reay brought the discussion to a close by the promise that the public wants of technical education should have his best attention. The subject was as large as it was important and required most careful treatment both as regards the principles and the practical details of organisation. Hence further discussion being desirable, Lord Reay invited to Poona Mr.

Nowrosjee N. Wadia, who was popularly looked upon as one of the captains of industry in Bombay, and on the 1st July 1886 His Excellency had a long interview with him on the subject. Two months later—on the 15th September 1886—Government issued a lengthy resolution reviewing the position as regards technical education in the Presidency, and embodying the result of their deliberations as to the lines on which it should be developed.

The whole subject was roughly divided into three branches according as the training related to (1) Agriculture, (2) Art Industries, and (3) Mechanical Industries. It was pointed out that the College of Science at Poona was the proper Central Institution for the teaching of scientific or higher agriculture and that local schools or classes should be established as feeders to the College under the management of Science teaching. Committees of influential agriculturists and others formed by Collectors and Educational officers.

For the purposes of Art teaching the resolution directed that the Sir Jamsetjee Jeejeebhoy School of Art in Bombay should be the centre of Government efforts in this branch of technical education. It was pointed out that by bringing before the eyes of the people all that is best in painting and sculpture from the lowest decorations to its highest pictorial forms, Government will have best promoted Arts both useful and artistic. It was considered that the School of Arts should fulfil this mission for the Presidency, as it had been undertaken by the South Kensington Institution for the United Kingdom.

The Resolution then proceeded to consider whether a Technological Institute should be established for the benefit of Mechanical Industries and putting aside the idea of such an Institute as being far in advance of the requirements of the times, and assuming that the question for immediate consideration was what instruction should be provided in the City of Bombay with a view to raise the scale of existing industries and prepare the way for useful developments, His Excellency the Governor in Council thought that what was wanted was an Institution located in the district where the mills are and near the Railway Workshops, and that in this Institution instruction should be provided in such sciences as are necessary for the practical requirements of the Managers and Foremen on the one hand and of the skilled operatives and others on the other.

Physics, Practical Mechanics, Chemistry applied to Arts, knowledge of the sources of raw materials, nature and use of tools, dyeing and bleaching, drawing plans and designs, theory of colour and beauty, the manipulation of cotton, jute wool and silk, their process of manufacture and the art of finishing the same in woven fabrics, the design and construction of steam and other engines,—these were named as the subjects suitable for instruction. It was not considered

necessary or desirable that all these should be undertaken at the start, but it was suggested that they may be gradually introduced as opportunities

The aim and object to be desired in the new Institution. presented themselves, the object of the proposed Institution being, it was remarked, to give the students a grasp of scientific facts which they could readily apply to any trade. The aim was not to put into the market the article of any industry, but to turn out the workmen fit to be employed in any industry.

The Resolution then went on to suggest the formation of an Association in the City of Bombay for the promotion of technical Government recognition. education, and intimated that Government would recognise and assist it to the utmost possible extent on the principles laid down.

The Resolution concluded with an appeal for public support in the following significant words :—

Special Industrial Schools. ' It is universally felt that new channels should be opened not to repress the intelligence of the country so largely developed by means of the education imparted

during the last thirty years, but to dissuade it from overstocking one field, by providing other appropriate ground. Various grades of technical education forming ends in themselves for various classes of the community must all tend to develop the material resources of the country and to improve the general condition of the people. His Excellency the Governor in

Appeal for co-operation. Council wishes to make a cautious and small beginning, out of which gradually a more complete fabric may be evolved by the process of natural evolution, to utilize existing resources to labour in a few and selected fields,

to work out the scheme almost entirely through native agency, to improve such native agency by giving them opportunities of completing their education in Europe and of witnessing the industrial, agricultural, mechanical, artistic and mercantile development of the Western world. The scheme is not academic, does not include legal and medical education, because it is not intended for the academic but for the producing classes. Its main object is to enhance the well-being of the people at large by giving increased employment to labour and capital in the Presidency and by cementing the harmonious relations which should exist between both.'

As has been stated this important resolution was issued on the 15th September 1886. About this time numerous movements Jubilee celebration. were set on foot throughout the country with a view to suitably commemorate the then forthcoming Jubilee of the glorious reign of Her Majesty the late Queen-Empress

Victoria whose many subjects of diverse races, religions and creeds heartily reciprocated the love which the great and good Queen bore them. In Bombay a Royal Jubilee Fund was started and the Municipal Corporation as representing the people of the City, set apart a sum of Rs. 80,000 for a permanent memorial of the auspicious event. They invited Government to

associate themselves with the movement. With characteristic sympathy with the feelings of the people and wise regard for their permanent welfare, Lord Reay at once responded to the invitation with the proposal for the establishment of a Victoria Jubilee Technical Institute, promising at the same time an annual Government grant of Rs. 25,000 for the maintenance of the proposed Institution. In a letter addressed to the Municipal Commissioner, his Lordship wrote :—

Jubilee Memorial. 'Government have considered carefully how they could best associate themselves with the movement set on foot by the Municipality to commemorate the Jubilee of Her Majesty's auspicious reign. They have come to the conclusion that the most pressing want of the people of this Presidency and of this City is an Institution which will promote the efficiency and skill of the artisan. Government believe that a Victoria Jubilee Technical Institute, managed by a Board composed of three representatives of Government, two of the Municipal Council, one of the Port Trust, one of the Chamber of Commerce, one of the Sassoon Mechanics Institute and one of the Jamsetjee Trustees will best meet the objects and needs of the hour. His Excellency the Governor in Council is prepared to give a grant of Rs. 25,000 annually on approval of the programme and the personnel of teachers, and on such conditions as may further be deemed essential. To make an immediate beginning possible and to show his personal interest, I am prepared under certain conditions to lend the greater part of Parel Government House to the new Institution. Government trust that the co-operation of all classes of the community in the various parts of the Presidency will eventually lead to the extension of the movement which cannot however be started in many places on account of the scanty resources at the disposal of Government.'

The Municipal Corporation accepted the suggestion and in addition to the lump sum of Rs 80,000, voted an annual grant of Rs. 5,000 for the maintenance of the proposed institution.

While the subject was before the Corporation Government had invited the Millowners' Association to identify themselves with the scheme, and the Committee of the Association readily responded to the invitation by the promise of an annual donation of Rs. 2,000 towards the funds of the proposed Institution.

Obviously the next step for the furtherance of the object in view was the formation of a Committee of Representatives. Government nominated Col. J. H. White, R. E., Mr. (afterwards Sir) George Cotton and Mr. Nowrosjee N. Wadia, A.M.I.C.E. as their representatives, and the other nominating bodies were informed that they were not restricted to select Members from amongst their own number, as the object was to have on the Committee gentlemen whose qualifications rendered them most fitted to further the end in view. The

first meeting of the Board, as the Committee was styled, was called at the Secretariat for Saturday, the 19th March 1887.

The Hon. Mr. Frank Forbes Adam was unanimously elected Chairman. At a meeting of the Board held on Thursday, the 24th March 1887, the rough draft of a scheme prepared by Dr. R. M. Walmsley, Principal of the Sind College of Arts, was placed before the Board, who, after a long discussion, allowed it to stand over, as there was no indication of the extent of the funds which would be available for a start. At this meeting Mr. Wadia was invited to undertake the duties of Honorary Secretary.

The combined efforts of the Chairman and the Honorary Secretary were now directed towards securing the funds needful for a satisfactory beginning. Within a few weeks they were able to secure to the Institute the transfer of the balance of the Royal Jubilee Fund, amounting to Rs. 35,331-6-6, and to announce that the amounts standing to the credit of Sir Jamsetjee Jeejeebhoy Second Bart. Memorial Fund and the Ripon Memorial Fund would be

made over to the Board on certain conditions. The subscribers of the Sir Jamsetjee Fund had agreed to transfer the balance of Rs. 45,951-4-6 on condition that it shall be expended on a separate detached building in connection with the Institute, the building being named after the late Sir Jamsetjee Jeejeebhoy, Second Baronet, and the subscribers to the Fund being allowed to nominate one Representative on the Board of Management of the Institute. The conditions proposed by the Trustees of the Ripon Memorial Fund were :—that the money amounting to over Rs. 1,50,000 shall be used in founding in connection with the Institute a school to be called the Ripon Textile School ; that the Committee of the Fund shall be allowed to elect five representatives on the Board ; that such representatives shall have the right of electing successors, and that in the event of the Institute failing to continue the work of technical education, Government undertake to maintain and continue the Textile School. The conditions were accepted and the two Funds were eventually transferred to the Institute early in the following year (1888).

Representative of the Sir J. J. Memorial. Mr. Dossabhoy Framjee, C.S.I., was nominated by the Committee of the Sir Jamsetjee Fund as their representative on the Board. The choice of the Committee of the Ripon Fund fell on the Hon. Mr. (afterwards Justice) K. T. Telang. The Hon. Mr. (now Sir) P. M. Mehta (K.C.I.E.), Mr. (afterwards the Hon. Mr. Justice) Budrudin Tyabjee, Mr. Sorabjee Framjee Patel and Mr. (afterwards Sir) Hurkisondas Narotamdas.

The Ripon Memorial Committee. While the negotiations with the Committees of the two Funds were in progress, the Board had also under consideration the Question of site. Sir Dinshaw's question of a suitable site for the Institute. Their efforts munificent gift. received an immense stimulus by the munificent

offer of the Hon. Sir Dinshaw Manockjee Petit, Kt., which was made about the end of the year 1887, to convey to Government his property known as the Hydraulic Press in exchange for the Elphinstone College building and premises, which he would then convey to Government as a gift for the purposes of the Technical Institute. The value of the property was estimated at Rs. 8,00,000. The Governor in Council accepted the offer with great gratification and ordered that the Elphinstone College buildings and grounds should be placed at the disposal of the Board of the Institute by the end of April next following (1888).

It was now time that the legal position of the Board and the relation of the Institute to Government should be reduced to writing and rules prepared for the administration of the Institute. The Board, hence, appointed a small Committee to draw up a constitution and the rules and regulations which should govern the management of the Institute. The Committee consisted of:—

The Chairman, the Hon. Mr. Frank Forbes Adam, Major W. S. Bisset, R.E., the Hon. Mr. K. T. Telang, C.I.E., the Hon. Mr. P. M. Mehta, the Hon. Mr. Budrudin Tyabjee and the Honorary Secretary, Mr. Nowrosjee N. Wadia, A.M.I.C.E., M.I.M.E.

The rules and regulations, as drawn up by the Committee, were duly approved by Government and were finally adopted and registered along with the Memorandum of Association under Act XXI of 1860 (The Indian Societies Act) on the 27th November 1888.

The object of the Association was declared to be 'To impart instruction to persons of either sex in the principles of Science and Art and their application to industrial and other purposes by—

- (1) the establishment of an institution in Bombay for the instruction of apprentices, workmen, foremen, managers and for training suitable technical teachers for the whole of the Presidency;
- (2) the establishment as funds permit of technical schools at other places than Bombay and the grant of assistance to such schools as may be affiliated to the Institute throughout the Presidency;
- (3) the holding of examinations in Technology in any manner that may appear practical and the granting of certificates of competency to those who pass the prescribed tests.'

By the rules and regulations the duty of carrying on the management of the Institute was vested in a Board of Trustees consisting of five Members and a Chairman to be appointed by Government, five Members to be elected by the Committee of the Ripon Memorial Fund, three Members to be appointed by the Bombay Municipality so long as they shall continue to contribute annually a sum of not less than Rs. 5,000 per annum for the working expenses of the Institute, one Member to be elected by the Trustees of the Sir Jamsetjee

Jeejeebhoy Second Baronet Memorial Fund and one Member to be appointed by the Bombay Millowners' Association so long as they shall contribute not less than Rs. 2,000 per annum for the maintenance of the Institute. The Board was given power to add to their number as Life Members (a) such persons as shall subscribe for the purpose of the Institute a sum of not less than Rs. 10,000 and (b) the representatives of such corporate bodies as shall subscribe for the purposes of the Institute a sum of not less than Rs. 50,000. They were further empowered to add to their number as Members the representatives of such corporate bodies as shall subscribe for the purposes of the Institute a sum of not less than Rs. 2,000 per annum so long as such subscription shall be continued.

The representatives of the Ripon Memorial Fund were to hold office for life and were to have the right of electing or filling up vacancies by co-optation. The Government nominees and the Chairman were to hold office during the pleasure of Government. Absence without leave from the Meetings of the Board for a period of twelve consecutive months was to entail on the absenting Trustee loss of his seat on the Board. The relation of the Trustees to the Government was definitely settled by the following provisions :

No sale of immovable property was to be made without the previous sanction of Government. The annual estimate of receipts and disbursements was to be subject to the approval of Government. The Books and Accounts of the Board were to be open at all times to the inspection of Government. The Institute was to be bound to furnish such statistical or other information as may be required by the Education Department and the Institute was to conform to the rules of the Grant-in-aid Code for Colleges as may be declared by Government from time to time to be applicable. The scheme of examinations was to be subject to the approval of the Education Department, and the certificates of qualification as teachers were to be countersigned by the Director of Public Instruction. Finally it was provided that no addition to or alteration in the Rules and Regulations was to be made without the sanction of Government.

Simultaneously with the preparation of the Rules and Regulations the Board took into consideration the question of the appointment of the Principal. The negotiations with Dr. Walmsley had fallen through, and after a long discussion at the meeting of the Board held on the 26th April 1888, Mr. J. P. Phythian, a Civil Engineer of the Glasgow University and Head Master of the Oldham Technical School, was appointed as Principal on a salary of Rs. 800 per mensem. And a small Committee consisting of the Chairman, Major-General J. H. White, R. E., Dr. Thomas Blaney, George Cotton Esq., and the Honorary Secretary was appointed to put the position of the Board in all its bearings clearly before the Principal and with him to draw up a scheme of operations,

The Principal in consultation with a small advisory committee drew up a scheme for the Institute. In brief his suggestions were:—

That Science Classes being fundamental for the future work in the Ripon Textile School and the Technological Engineering Science Classes. branches, a commencement should be made by the opening of classes in a few important subjects, namely, Machine Drawing, Steam and Steam Engines, Theoretical and Applied Mechanics, Physics, embracing Sound, Light, Heat, Electricity and Magnetism. That in all these subjects Night Classes should be commenced in a few months after the Day Classes had been formed.

That Day Students should be admitted from applicants who had passed the Vth English Standard of the Educational Department, or persons seeking admission should have attained the age of 14 years and should be required to pass an entrance examination, satisfying the Principal that they were qualified to attend the Institute.

Fees.

That the fee for Day students should be Rs. 3 per month and that for Evening Students Re. 1 per mensem.

That free Day Teaching Scholarships might be given to one or two students in Mechanics and Physics, on the understanding that the scholars should afterwards give assistance without salary for two years in the Day or Evening Classes as required.

That a preliminary grant be made of Rs. 5,000 in order to arrange the building with proper fittings, etc., for a small beginning.

The scheme which was entirely preliminary and necessarily incomplete, received considerable additions from the Honorary Secretary, who suggested that the cook-room and out-houses should be converted into the Mechanical Engineering Workshop, to be named after the late Sir Jamsetjee Jeejeebhoy, Bart. He also prepared plans and estimates for the conversion of the Gymnasium building to be used for the Ripon Textile School. Mr. Wadia drew up lists with prices of the machinery and tools required for the equipment of the two departments, and in consultation with the Principal worked out in detail the fittings and furniture for the Science Classes which, it was suggested, should be held in the main buildings.

The scheme thus enlarged was placed before the Committee appointed for its consideration along with a draft syllabus and time table prepared by the Principal, and on the recommendation of the Committee the scheme received the sanction of the Board.

The remodelling of the out-houses and the gymnasium for the purposes of the Sir J. J. Mechanical Engineering Workshops and the Ripon Textile School was also undertaken, and contract for the work was given to Fakirmahomed Babanbhoy, who finished it satisfactorily about the end of

the year. Thus the necessary preliminaries having been arranged, the Board was asked to appoint a qualified master for the Ripon Textile School and a staff for the Science Classes. Mr. Hugh Monie,

Head of the Textile School appointed. Jr., of Belfast, was selected for the important post of Head of the Textile School on a salary of Rs. 500 per mensem for a term of five years. The staff engaged for

the Science Classes included Mr. C. H. Good, who was appointed Head Drawing Master, and Dr. H. K. Tavaria, B.Sc., L.M. & S., who was placed

in charge of the Physics Classes and Laboratory. Applications for admission were now invited and Science Classes were informally opened on the 1st September 1888

with a full complement of 120 students. Many more desired admission, the applications for the programme numbering 700. Rather than disappoint so many applicants, the Board decided to take in 120 more and sanctioned extra fittings and furniture for the purpose. By the end of the month these were arranged, and on the 1st October 1888 a further complement of 120 students was admitted, making in all 240 day students. At the end of the next month Lord Reay honoured the new Institution by a visit, and in the following week, *i.e.*, on the 5th December 1888, the Chairman and Honorary Secretary of the Board had the privilege of welcoming the Viceroy Lord Lansdowne and showing him the arrangements made and in progress.

The formal opening of the Institute by His Excellency the Governor Lord Reay in the presence of T. R. H. the Duke and Duchess of Connaught, took place on Wednesday, the 10th

April 1889, which is regarded as a red letter day in the history, not only of the Institute and Indian education, but that of the providential connection of India with England, for it was on that day that, as Lord Reay said, 'there arose on Indian soil the first monument to the foresight of the late Prince Consort whose name must be for ever associated with the development of British Technical Education.'

At the opening of the Institute it was stated that arrangements were in progress for the opening of the Evening Classes for the instruction of workmen and others employed in the mills and factories of the City in the sciences underlying the practice of their calling. These classes were accord-

ingly opened on the 17th June 1889 with 118 students on the rolls. Here the instruction was limited to Drawing and Practical Work in the Physical Laboratory and lectures in Steam, Mechanics, Physics, the Nature and Use of Machine Tools and in Cotton Spinning and Weaving.

Although the number on the rolls was large, the daily attendance was comparatively very small, *viz.*, between 22 and 39. This was not altogether a matter for surprise, considering that many of those who joined did not understand sufficient English to follow the lectures, which had of necessity to be given in English and that the hours of attendance followed in the great majority of cases, a day's hard work without any considerable

interval for meals and rest. These classes were eventually closed in 1897 and have not been re-opened since.

The principal work of the Institute was however in connection with its Day Classes. Day Classes which, as has been observed, were opened on the 1st September 1888. Here the hours of instruction were from 10 a.m. to 4-30 p. m., with $\frac{1}{2}$ hour's interval for tiffin. The courses extended to three years. The subjects common to both departments—Mechanical Engineering and Textile Manufacture—comprised Drawing, Lectures in Steam, Mechanics and Physics and Practical Work in the Physical Laboratory. In addition the Engineering students received lectures on the nature and use of Machine Tools, and the Textile students were instructed in the theory of Cotton Spinning and Weaving. In the workshops the Engineering students had to pass through six sections—Pattern-making, Foundry, Smithy, Machine Tools, Lathes and Fitting, while the practical work in the Textile School comprised, Ginning, Opening and Scutching, Carding and Drawing, Framing, Ring and Mule Spinning and Weaving.

It was necessary to draw up a comprehensive scheme for the examination of the students in attendance and a small Committee was appointed for the purpose. The Committee had the benefit of the experience of the Hon. Mr. K. T. Telang, C.I.E., and Mr. K. M. Chatfield, M A., Director of Public Instruction. The scheme drawn up by the Committee was approved by the Board and sanctioned by Government during the year (1889-90). There were to be outside Examiners for all practical examinations and for the science subjects of the final examinations. The rest were to be conducted by the Principal and the Master of the Departments in the Institute acting as Examining Masters. No student was to be admitted to any examination unless he had attended 75 per cent. of the lectures and practices given during the year. The rules provided for the proper delivery of question papers, vigilant and silent supervision, distribution of papers and arrangement of test apparatus, tools and machines, and among other things it was laid down—

(1) that the papers set are not in quantity and quality more than a well-prepared candidate could answer fully in the appointed time, and that there should be no violent change of standard in the question papers ;

(2) that a single certificate will be given showing all progressive successes in Science and in Technology, the certificate to be signed by the Director of Public Instruction ; and

(3) that to obtain a full Technological Certificate granted by the Full Tech. Education Department, a candidate must have completed a course of three Sessions in each of the technological Certificate. prescribed Science subjects and in Technology. Candidates taking the Engineering course must obtain in each year

three Science Certificates, of which two at least are in—

Machine Drawing,

Mechanics and Steam,

and also four Practical Technological Certificates during the three Sessions. Candidates taking the course of Cotton Manufacture must obtain in each year three Science Certificates, of which two at least are in—

Machine Drawing,

Mechanics and Cotton Manufacture Lectures,

and also four Practical Technological Certificates.

During the three Sessions candidates must obtain $33\frac{1}{3}$ per cent. of the full marks in each of the prescribed Science subjects and in the four departments of Technological subjects, also obtain 40 per cent. of the total marks obtainable in those subjects during the three years.

Those of the successful students who obtained $66\frac{2}{3}$ per cent. of the total marks obtainable in those subjects will be placed in the First Class and those obtaining 50 per cent. in the Second Class and those who obtain 40 per cent. in the Pass Class.

The Board authorised such of the students as passed in the First Class to designate themselves as L.M.E. (Licentiate of Mechanical Engineering), L. T. M. (Licentiate of Textile Manufacture).

Diplomas.

The first practical examinations were conducted in 1890 and the reports of the Examiners showed that a large majority of the students examined had done well.

The question of the granting of certificates of competency as Engineers under the Bombay Boiler Act to successful students of the Institute, came up for consideration in the year 1890-91. The Board had addressed Government in September 1888, requesting them to authorize the Institute to grant certificates of competency under the Act, and had been informed that there was some legal difficulty, in the way of granting the authority to the Institute, and that the question may be brought up when the Act is revised or amended. The question was one of vital importance to the Institute, as without a certificate under the Act no one was permitted to take charge of engines and boilers in the Presidency. Considerable anxiety was prevalent among the students, as, under the rules in force framed under the Act, they might not be allowed even to appear for examination without further service on engines and boilers.

The Board therefore requested the Honorary Secretary to write to Government for amendment of the rules, with a view to admit students of the Institute to examinations under the Act without further service on engines and boilers after they had left the Institute with a three years

course and a full Technological Certificate. As a result the modifications suggested were duly made and were notified in the *Government Gazette* in February 1891.

In the course of his address, delivered on the occasion of the presentation of the awards in 1892, H. E. the Governor, Lord Harris, observed: 'We believe from the reports of the examiners and from the care we know their instructors have given them that these young men who have crossed the platform to-day are worthy of employment. Now the anxious question is, is that employment waiting for them, and if it is (we hope and we may fairly hope it is), we may be certain that the demand for education of this kind will increase. If we look a little ahead of the present day, if we may hope, and I think it is only reasonable we should hope, that some of these young men, who are passing through the Deccan College of Science and the Technical Institute here, will raise themselves to the higher walks of their profession, it must mean in time that they will absorb those appointments about factories in connection with manufactures, about railways, and generally in connection with manual work and the management of manual work which up to now have been largely held by Europeans. I see no reason at all, if they are capable of doing as well as Europeans, why we should grudge them the advantage which has been given them.'

These were liberal views indeed, but rather unfortunately for the Institute they were not, and in the nature of things could not be, easily acceptable to the class whose displacement they indicated. Whether in consequence of the large influence exercised by this powerful class or not, at the examinations under the Boiler Act held in March following (1892) all the 42 candidates from the Institute who presented themselves were declared failed. As far as could be learnt the majority had passed the written examinations (which were held on the 9th and 11th March), but every candidate had been declared failed in the *viva voce*, not, it was alleged, on the questions set but on the ground of not having worked in a mill. The majority were asked—Have *you worked in a mill?* and it was reasonable to believe that there must have been a misconception on the part of the Examiners as to the concession made by Government by the modifications in the rules under the Act, whereby successful students of the Institute had been permitted to appear at the examinations without further service in any factory or workshop or mill. The Board protested and the Collector was instructed to make enquiries into the cause of the failure and pending such enquiry to order that the students' answer papers be not destroyed. The Collector promised to bring the matter to the notice of Government on the return of the papers from the Examiners. The Examiners stated to the Collector that the candidates had failed in *viva voce* through deficiency of knowledge in case of accidents and breakdowns and on other points of practical experience in the management of boilers. The matter was again placed before the Board who authorised the Honorary Secretary to reopen the consideration of the Board's proposal made in

October 1888 and accepted by Government, that the examinations under the Act be held by the Institute in its own name and the Institute be empowered to grant certificates on the results of such examinations, Government appointing one of the two examiners. The Chairman also approached His Excellency the Governor who considered a separate Board of Examiners undesirable, but thought it would be better to strengthen the present Board. It was eventually agreed to await the result of the changes proposed in the constitution of the Board of Examiners before addressing Government further on the subject.

In the meantime the Honorary Secretary had several consultations with the Principal with a view to effect such improvements in the courses of instruction and kindred matters as may be possible. A collection of articles of trade and manufacture was started, which, it was hoped, would materially help the students in their studies and would bring the Institute prominently before manufacturers and others interested in the development

of the industries of the country. Letters were addressed to various manufacturers with a view to getting their assistance and some responded by presenting to the Institute a few articles. A Defects Collection was also started illustrative of corrosion and other actions to which materials are subject and showing also what defects in manufacture or in material had contributed to failure. The object of this collection was to impress upon the students where and how materials and machinery gave way through the defects either of construction or of material.

As another auxiliary to the instruction imparted in the class rooms a Library was established, towards which presents of books were received from various publishers. The Library now contains over 1,100 volumes on subjects connected with trade, manufacture and science. It is regularly supplied with 32 Weeklies, 2 Fortnightlies, 16 Monthlies, and 2 Quarterlies relating to manufacturing, mechanical and science subjects. It is kept open at stated hours daily and, with the permission of the principal, students are allowed to take books out of the Library for home reading.

The programme of class work and time-table were also revised with the view of giving a larger amount of time to practice in the workshop without curtailing the time devoted to the lectures. The second term was lengthened by about three weeks by shortening the October vacation from 7 to 4 weeks.

The standard of admission was raised from the Vth to the VIth Standard. A higher standard of preliminary education was considered desirable, but it was feared that the change would be a jump which might not be to the interest of the institute just then.

The usefulness of the instruction was thus enhanced, but the effect produced by the wholesale failure of the 42 candidates at the Boiler Act

Examinations in March 1892, of which mention has been made previously, could not pass away in so short a time. To add to the difficulties of the

Boiler Act Institute-trained students in the matter of employment. again. it was proposed by the authorities, who had the framing

of the rules for the examinations under the Boiler Act, to withdraw the permission granted to the students to sit for the Second Class Certificate Examinations altogether and to restrict their entry to the 3rd Class Certificate tests, thus creating in the minds of the employers, who, it may be stated, did not in many cases fully appreciate the advantages of technically trained operatives and foremen, a doubt as to the practical value of the Institute-trained students. The subject was taken up by some of the journals and the Institute came in for some adverse criticism. There was a falling off in the numbers attending and seeking admission to the Institute. A public reply from the Board was obviously necessary in the circumstances to allay the fears raised in the public mind as regards the suc-

Distribution cess of the Institute, and this was furnished by the of Awards, 24th speech of the Chairman of the Institute, delivered on March 1894. the 2nd March 1894 on the occasion of the Public Presentation of Awards to the successful students by H. E. the Governor, Lord Harris, Mr. (afterwards Sir George) Cotton who had succeeded Colonel Bisset as Chairman about two months previously, in the course of his opening remarks observed: 'The Board having been anxious to learn what became of students who had passed through the Institute made careful enquiry regarding the first two batches sent out, and I am pleased at being able to state that of the 138 students concerned 87 have been traced and found employed on salaries ranging from Rs. 25 to 150 per month. I have no doubt that most of the remaining 51, of whom no information is available, have also found remunerative employment. I think the fact that 68 per cent. of the students who have passed out of the Institute are employed in the branches for which they were instructed shows how very groundless are the complaints frequently heard that the students who have passed through the Institute do not find the training and instruction it gives of any benefit to them in obtaining employment. I would also point out that from a statement kindly placed at my disposal by the Senior Inspector of Boilers we observe that during the year 1893-1894, 49 out of 59 students who presented themselves passed successfully the Second Class Engineers' Examination (under the Boiler Act). This gives a percentage of 83, while of the 196 candidates who had not the advantage of being trained in the Institute only 81 passed, say a percentage of 41. These results, I submit, show that the Institute qualifies its students for employment, and as the growth of small factories in India is annually increasing, we may work on feeling tolerably comfortable that for years to come our supply of thoroughly qualified Second Class Engineers will not exceed the demand and that every hard-working student in the Institute may feel that remunerative employment will be the reward of good work in the Institute. The admissions just now are fewer than they were at first, but the Board have, on a former

occasion, pointed out that when the Institute was first opened there was a rush for admission. Some came who were physically unfit to follow the course of instruction. Others entered under the impression that a course of technical education would in itself fit them for employment as Engineers, Carding or Spinning Masters or even as Managers. They did not realise that whatever technical instruction the Institute might give, it could only be of commercial value when combined with practical experience.' H. E. Lord Harris, who presided, as stated previously, in the course of his observations, remarked : ' Your reply, Sir, I should imagine will be satisfactory to the public of whom I am one, and I have no hesitation in saying that the reply you have made is a satisfactory one. I congratulate the Board upon the success it has met with in the past and I sincerely hope it may continue to be as successful in the future.'

The Board's reply and the reassuring remarks of the Governor had the effect of silencing the adverse criticisms and the abandonment of the proposals for the withdrawal of the permission granted to the successful students of the Institute to sit for the Second Class Engineers' Examinations under the Boiler Act. But although the Board had no cause to complain of want of means and the Institute had buildings, appliances and a staff capable of giving a sound technical education ; although there were many scholarships, the fees almost nominal and an ever increasing demand for engineers, mechanics and overlookers in mills and factories, yet the Institute was not full or half full in spite of the additional fact that 78 per cent. of the young men, who had passed through the full three years' course, were known to have obtained remunerative employment. Why this should be caused the Board much thought and the reports were called with the object of seeing if anything could be done that would draw more students. It was feared that here, as was the case in the early days of technical education in Europe, the advantages of such an institution as the Institute were not fully understood nor appreciated by the classes whom it was intended primarily to benefit. The difficulty was there and it had to be faced with quiet fortitude. The Board felt that they must move cautiously and that careful consideration must be given to every advance they wished to make. The untiring energy of the Hon. Secretary had now prepared the way for the establishment of a trade school in connection with the Institute. He had obtained the consent of

Metal Work-
ing and Ena-
melling.

Sir Dinshaw Manockjee Petit to the transfer of the fund raised in that gentleman's honour by his friends and admirers to commemorate the occasion of his knighthood, which fund had accumulated with interest to over Rs. 40,000, for the establishment of a school for working in Metals and in Enamelling. In conjunction with Mr. Monie, Mr. Wadia had laid out the designs of the buildings and equipment of the new department and on the acceptance of the scheme by the Board preparations were made for laying the foundation of the new school to be called the Sir Dinshaw Manockjee Petit, Bart, School for Sheet-Metal Working and Enamelling. In view of

the unlimited demand there always was in the country for metal vessels of every description, it was hoped that small metal factories would spring up managed by the young men the Institute proposed to train up in the new school. The field for enamelling—an art unknown in this country—was also considered to be large. H. E. Lord Sandhurst was invited, and on Tuesday, the 24th March 1896, kindly laid the Foundation Stone of the new School in the compound of the Institute in the presence of a very large and influential gathering of ladies and gentlemen. The building was estimated to cost about Rs. 28,000, and orders for machinery and plant of the approximate value of Rs. 27,000 were under consideration.

Here the thread of management was suddenly broken by the untimely death of the Principal Mr. Phythian (July 1896) after only a fortnight's illness, and the Board appointed Mr. H. Monie, the Senior Member of the Staff, to officiate as Principal. During the eight years that Mr. Phythian had held the office of Principal, he had given complete satisfaction to the Board by his great energy and undoubted ability in the internal administration of the Institute, and by his work as an able and sympathetic teacher for whom his pupils had great respect and regard. Outside the Institute Mr. Phythian was held in esteem by all classes of men with whom he was brought into contact.

A few weeks prior to his death Mr. Phythian had submitted the reports to which reference has been made, and for the consideration of which a Sub-Committee had been appointed consisting of—The Chairman Mr. G. Cotton, the Hon. Mr. Justice M. G. Ranade, Khan Bahadur M. C. Murban C.I.E., Principal J.T. Hathornwaite, M.A., Mr. G.A. Barnett, C.I.E., and the Hon. Secretary, Mr. Wadia.

The Committee had met and made its report on the 14th July 1896, but its discussion had to be deferred in consequence of the death of the Principal. The principal recommendations of the Committee may be briefly stated here. They were as follows :—

- (1) That, in order to obtain the diploma, the students should be asked to go through a five-years' course, the three-years' course being continued for such candidates as desired to qualify themselves for a certificate only.
- (2) That the Time Table be so revised as to embrace less theoretical teaching and more practice in the workshops during the first three years.
- (3) That the qualifications for the diploma should include (a) the completion by the candidate of some small piece of work comprising in its execution most of the departments of practical training, and (b) ability to work for a fair number of hours in continuity.
- (4) That a course of popular evening lectures be given by the Principal and Heads of Departments.

- (5) That the workshops should be so administered as to produce work that would meet with a ready sale, and that they should be kept open from 9 a.m. to 5 p.m. daily, except on Saturday, when they should be closed at 1 p.m.
- (6) That the length of the May and October vacations should be reduced to 6 and 4 weeks respectively.
- (7) That efforts should be made to organise classes for instruction in Plumbing and Sanitary Engineering, Electric Transmission and Power, Brick-work and Masonry and Carpentry and Joinery.
- (8) That a Library be opened for students.

The Officiating Principal took up the question, and, agreeing with most of the recommendations of the Committee, Mr. Reforms in- Monie prepared a revised programme which was duly troduced. considered and sanctioned by the Board. It provided for—

The opening of a Library for students.

The institution of popular evening lectures.

The reduction of the vacations.

The extension of the hours devoted to practical work so that first and second year students could devote 13 hours to *lectures* and drawing and 27 to Workshop practice, and third year students could give 11 hours to lectures and drawing and 28 to Workshops.

The holding of the Science Classes in the mornings when the students are quite fresh and the assignment of the manual or practical work to the afternoons.

Instruction in Practical Locomotive Engineering.

The turning out of saleable articles.

The letting out of rooms on the top floor of the main buildings to students for residence,

Advanced instruction for a fourth year at the option of the students.

The new programme commenced to take effect from November 1896.

About this time the Hon. Secretary, ever eager, and anxious to extend the scope of usefulness of the Institute, conceived the City & Guilds London Exam- idea of giving the Indian students the opportunity for inations. competing with English students at the Technological Examinations held by the City and Guilds of London Institute. He suggested that the authority of the London Institute should be obtained to hold their examinations in Bombay. The proposal met with the approval of the Board and the authorities of the London Institute also willingly agreed to authorise the Bombay Institute to conduct the examinations on their behalf, in Bombay, for Indian students. The first of these examinations were held at the Institute in May 1897, 16 candidates being examined. The question papers were sent out from England and the

answers of the candidates were transmitted to London for examination. Of the 16 candidates, 11 were students of the Institute, 6 from the Textile School presided over by the Principal and 5 from the department of Mechanical Engineering. All 6 of the Textile School and 3 of the other 5 were successful, a result which was highly complimentary to the staff and the students. Since then a high percentage of successes has been maintained. Another development about which Mr. Wadia had been very keen for some

time was the establishment of Classes for instruction in Plumbing and Sanitary Engineering.

time was the establishment of Classes for instruction in Plumbing and Sanitary Engineering, a science which was much neglected, but which was daily becoming of more vital importance to the country. He drew up an outline of a scheme, but the unsatisfactory state of his health prevented him from pursuing the subject much further.

In the latter part of Mr. Murzban's administration as Secretary* the Hon. Secretary had to meet the difficulties which arose in the working of the school for metal working and enamelling, owing to the attitude of the Enamelling Master in respect of the composition of enamels which he considered was a trade secret, and the proposal of the authorities under the Boiler Act for the addition of outside practice to the three years' course at the Institute as a necessary qualification for admission to the Second Class Boiler Act Certificate Examination. Eventually the Enamel-

ling Master resigned, and in regard to the Boiler Act Examination, Government imposed a year's outside practice on the students of the Institute in spite of the strong representations of the Board against the proposal. The imposition of this restriction and the unsuccessful working of the Enamelling School had adversely affected the popularity of the Institute and were calculated to arrest its progress.

While Mr. Wadia † was the Honorary Secretary, nearly *two thousand* students had passed through the three-years' course in Position at Mr. Wadia's death. whole or in part, and of these, 251 had obtained the full Technological Certificates of the Institute, 143 had secured the certificate of the 1st Class in Mechanical Engineering with the title L.M.E.; 44 the certificate of the 1st Class in Textile Manufactures, with the title L.T.M.; 50 the certificate of the 2nd Class in Mechanical Engineering; 11 the certificate of the 2nd Class in Textile Manufactures; and 3 the certificate of the Pass Class. Over 75 per cent. of the students were known to have secured employment at an average monthly salary of Rs. 100; over 100 of the successful students had appeared at the 2nd Class Engineer's Examination under the Boiler Act, and about 60 of them had satisfied the test. During these twelve years the average annual income amounted to Rs. 65,000 consisting of the Government grant of Rs. 30,000, the Municipal contribution of Rs. 10,000, Interest on Investments Rs. 12,000,

* He was appointed in 1899.

† Mr. Wadia died in December 1899.

and Fees and Miscellaneous Receipts Rs. 13,000. The average annual expenditure amounted to Rs. 63,000, made up of Rs. 50,000 for Salaries, Rs. 6,000 for Coal and Stores, Rs. 7,000 for Insurance, Taxes, Advertisements and other General Charges. The average number of students on the roll was about 175, and the average cost per pupil per annum was about Rs. 360. There had been received in money value on account of Capital Rs. 4,17,000 exclusive of the value (Rs. 3,00,000) of the buildings and premises presented by Sir Dinshaw Marockji Petit. Of this sum, Rs. 41,500 had been expended on building and building alterations, and Rs. 1,38,500 on machinery and the equipment of the different departments leaving a balance on account of Capital of Rs. 2,37,000 which was invested in Government and other Securities. There had been also received sums aggregating to Rs. 73,200, the interest on which was to be applied to the grant of scholarships, prizes and other awards.

The death of Mr. Wadia caused a vacancy on the Board of Trustees. It also rendered vacant the office of Honorary Secretary which Mr. Murzban had accepted on the understanding that it was to be held by him during the absence on leave of Mr. Wadia. The ap-

Mr. Moos as Hon. Secretary. pointment of a successor to Mr. Wadia was a matter of anxious consideration. The Board awaited the nomination by Government of a successor in the Trusteeship, and, pending the decision of Government in that matter, they withheld the appointment of the new Honorary Secretary. On the 9th of March 1900 Government appointed Mr. N. A. F. Moos, B.Sc., F.R.S.E., L.C.E., F.I.C., Director of the Royal Observatory, as a Member of the Board, *vice* Mr. Wadia. Mr. Moos' attainments in Science and his long connection with the Education Department of Government were admittedly the very qualifications of an ideal Secretary. The Board, hence, welcomed his appointment as Trustee, and requested him kindly to accept the office of Honorary Secretary, which he did in April 1900. How valuable Mr. Moos' services have been to the Institute during the eight years he has served as its Trustee and Organising Secretary in initiating the various improvements and developments undertaken by the Board since 1900, the following pages will clearly show.

Shortly after Mr. Moos accepted the office of Honorary Secretary, the Chairman, the Hon. Mr. W. H. Hughes, resigned, and Government filled up the vacancy by the appointment of the Hon. Mr. S. Rebsch, M. Inst. C. E., as the new Chairman.

This change added considerably to the responsibilities of the new Honorary Secretary at the outset. The troubles in the working of the Enamelling School had not terminated and constituted a source of no small anxiety to the Honorary Secretary. About this time the Head of the Department of Physics, Dr. H. K. Tavaría, B.Sc., L.M. & S., who had served the Institute with zeal and energy for a number of years, died, and there were signs of an approaching rupture between the Principal and the Mechanical Engineering Master. The situation was difficult and required

careful treatment. The Enamelling Master had appealed to the Board for a free hand in the conduct of the department in order to be able to show satisfactory results. He was placed temporarily under the direct control of the Honorary Secretary and was given such facilities as he sought for the successful working of this department. The result proved somewhat satisfactory and some good work was done, but it was not to continue very long, for the Enamelling Master was dissatisfied with the prospects the Board could offer, and he eventually resigned his appointment. In the Department of Physics Mr. D. D. Kapadia, M.A., B.Sc., had been appointed to the vacancy caused by Dr. Tavariah's death. He had to be allowed to resign in consequence of his appointment to a Professorship in the College

of Science at Poona. The friction between the Mechanical Engineering Master and the Principal terminated in the retirement of the former. In the Science Classes

the three years' engagement of the Lecturer in Steam and Mechanics was about to terminate. In the other departments the staff generally had not had any material encouragement for some time and a re-organisation appeared necessary. Hence in October 1900 a Committee

1901-02. was appointed to consider the question in connection with the preparation of the Budget Estimates for the ensuing year. The first half of this year (1901-02) will ever have a most melancholy interest, for it was during this period that India suffered the loss by death of the greatest and most beloved Sovereign of modern times, the Queen-Empress Victoria; one of the foremost leaders of new Indian thought and aspirations and a man of gigantic intellect who was respected throughout the length and breadth of the country as much for his high thinking as for his plain living, the Hon. Rao Bahadur M. G. Ranade, M.A., L.L.B., C.I.E., and one of the greatest public benefactors of the country and the munificent donor of the magnificent home of the first and most advanced Technical Institute in the country—the Hon'ble Sir Dinshaw Manockji Petit, First Baronet. The latter half of the year is rendered memorable in the history of the Institute by the introduction of the Honorary Secretary's scheme of re-organisation, the immediate fruit of which was a new section for training students in electrical science and

Electrical En- engineering. For a long time this branch had been gineering intro- considered a most suitable and desirable addition to duced. the scope of usefulness of the Institute. The difficulty

had been the want of funds. Mr. Moos' scheme of re-organisation enabled the Board to provide a chair of Physics and Electrical Engineering and to purchase the apparatus urgently needed for a small beginning in the new department. Mr. S. Joyce, an English Electrician of large experience, was appointed to the chair, and the work of instruction was commenced in January 1903. The Board recognised that the equipment of the new department was far from complete or satisfactory, and they were anxious that it should be thoroughly well-equipped for the requirements of a complete theoretical and

practical course of instruction. But they were not prepared to rob Peter in order to pay Paul, Peter being the older departments of Mechanical Engineering and Textile Manufacture. They had increased the salary of the post of Head of the Mechanical Engineering Department and were fortunate in securing for the appointment the services of Mr. T. S. Dawson, an English Engineer of large and varied practical experience, who

possesses in addition a thorough grasp of the scientific facts and principles underlying his profession. On his representation the Board sanctioned a suitable extension of the Foundry and Smithy sections to meet the growing demand for admission. Efforts were made to secure in the Textile School the maintenance of the high standard of efficiency which had enabled the students passing out of the school to obtain ready and remunerative employment.

The growing popularity of the Institute had the effect of a large increase in the number of applicants for admission, and Entrance examination. in 1903 the demand increased to such an extent that the Trustees had to consider the means by which to limit the number of students. The alternatives were either to increase the amount of fees payable by the students, and thus make the money qualification the test for entrance or to subject the applicants to an entrance examination, by the results of which they should be admitted. The Trustees adopted the latter alternative, and it was hoped that, in securing a generally higher level of education preliminary to admission, the Institute might be able to demand a higher standard in the annual examination, with the result that a better class of trained men might be sent out into the world. Those of the applicants who had passed the Matriculation or the School Final examination were exempted from this examination, but others were admitted only in the order of merit shown by the marks obtained in the entrance examination up to the number of available vacancies. The subjects of the examinations included rough outline drawing from a black board example, English composition (such as to describe any railway journey the candidate had made), dictation in the form of taking down a few sentences carefully read out by one of the examiners, and mathematics comprising general arithmetic and algebra up to simple equations. Since then modifications in the test for entrance have been made as suggested by the experience gained year after year. The entrance examination now includes—

- | | |
|---|--|
| 1 | Paper of one hour's duration in English Composition. |
| 1 | Do. do. in Simple Free-hand Drawing. |
| 1 | Do. do. in Mathematics as at Matriculation. |
| 1 | Do. do. in Chemistry as at Matriculation. |

The public interest in technical education, aroused by the proceedings of the Committee appointed by the government of Lord Curzon, to which reference has been made and the publication of a Government of India Resolution dealing with the recommendations of the Committee, was enlivened by the holding of an Educational Conference early in

Educational Conferences. March 1904 under the presidency of Hon'ble Mr. E. Giles, M.A., C.I.E., the Director of Public Instruction, Bombay. The Conference was attended by Messrs. Wallace and Burns as representatives of the Institute, Mr. Monie, the Principal, attended the Conference by invitation. The discussion lasted for two days. The subjects considered were—

- Scholarships for training Indian students in England;
- The provision of normal classes for training technical teachers;
- The supervision or inspection of technical and industrial schools, and
- The requirements of particular institutions.

The Conference formulated a resolution in favour of developing classes in connection with the large central institutions and the expansion of such institutions and their inspection by experts; and a systematic development of the hand-loom industry. State Technical Scholarships in connection with textile industries were approved. Mr. Monie urged on the attention of the Conference the necessity of funds for the Departments of Electrical Engineering and Technical Chemistry in the Institute.

In the following month the Hon. Mr. Rebsch resigned the office of Chairman in consequence of his retirement from India, and Mr. G. Owen Dunn, who had succeeded him as Chairman of the City Improvement Trust, was appointed Chairman in his place. About this time complaints were made in the press that the management of the local mills and

Public Criticism. factories had not fallen into the hands of those who had studied in the Institute, and the propriety was questioned of spending large amounts and carrying on the work on the lines adopted. The criticism was made the subject of a motion in the Municipal Corporation for a Committee of Inquiry. A public reply from the Board was necessary to allay the fears raised in the public mind as to the success of the Institute, and this was furnished by the speech of the Chairman delivered on the 11th November 1904 when the motion came for discussion before the Corporation. In that speech the Hon'ble Mr. Dunn very ably defended the Institute from its critics. He said he was unable to support the motion, because criticisms, which were conceived certainly in no friendly spirit towards the Institute, were engaging the attention of the Board of Management, and as the Corporation was strongly represented on the Board, they might consider their interests were in good hands. He was not sorry, however, that the matter was brought forward because it gave him an opportunity of putting before the public the general facts. The

Chairman proceeded to point out that the Institute was not merely professional but disciplinary, and aimed not so much at turning out a mechanic fully equipped for one particular industry as to give such an elementary training as would enable the student, when he selects his profession and enters the workshop, to make much faster and more intelligent progress than untrained mechanics. With regard to the criticism that a large proportion of the students failed to obtain employment, Mr. Dunn observed that this was a very serious indictment and probably more serious than any of the others as regards its effect on the Institution, for it touched more closely the prospects of intending students. The critics of the Institution appeared to think that it ought to turn out a student at the end of his three years, a finished craftsman. It could not be too strongly insisted upon that this was not nor could it be the case. The object of the Institution was to give the student sufficient scientific training combined with as much practical work as time would allow, so that when his time at the College was finished, he could work with his head as well as his hands while he was perfecting himself on the manual part of occupation he had chosen. If a student imagined that he was a finished craftsman when he left the Institute, he had himself to thank if he failed to obtain remunerative employment. The Chairman proceeded to give figures as regards employment, and showed that, out of 266 diploma holders who could be traced, 251 were reported to be employed, and as regards the remaining 15 it was at least equally just to assume that they were employed as that they were unemployed. Mr. Dunn then turned to the statement that the salaries obtained had given rise to considerable disappointment and gave figures which showed that upwards of 50% were in receipt of Rs. 100 and more. Referring to the allegation about the large expenditure of the Institution, Mr. Dunn pointed out that the cost was not calculated by the critics in the correct way, and their figures were apparently intended to give a wrong impression. He explained that the proper way of comparing the cost was by pupils attending, not by pupils passed out, and he showed that, on the average of the past 15 years the cost per student at the Institute had been Rs. 350, that of the Grant Medical College Rs. 480 and of the College of Science of Rs. 740. It was implied that the reason for the high cost per student was the very small percentage of pupils who obtained the diploma, viz., 14%. Mr. Dunn showed that only 9 per cent. of the students of the Grant Medical College obtained the L. M. and S. degree, and 13 per cent. from the Elphinstone College obtained the degree of Arts, that the average for all Arts Colleges was 11 per cent. The average of all the Professional Colleges was 12 per cent. The Chairman then alluded to the opposition to the Institute, and stated that it was of the same class as that which technical education had had to face in other countries in which it had been introduced. It was conceived in the same spirit as that which led the hand-loom workers of Lancashire to riot when steam-running machinery was first introduced. But there was evidence that the students of the Institute were being

gradually more and more sought for, and that they were in fact demonstrating to unwilling and prejudiced masters their capability and usefulness. Mr. Dunn concluded by expressing his belief that the Institute would be able to show increasing progress, and would in time overcome the opposition it had now to face.

The speech was a complete answer to the criticism, and the discussion might well have ended there, but it was not to be. Some of the later speakers introduced into the debate much purely personal matter, and the discussion occupied three sittings. In an elaborate and eloquent speech, extending over two sittings, the Hon. Sir P. M. Mehta dealt with the later criticism in minute detail, and having thoroughly exposed the hollowness of the agitation concluded by observing that, like all other educational institutions in the country, the Institute was not perfect, it was ill-equipped but it was the duty of the Government as State landlords and of wealthy mill-owners and mill agents to dive their hands deep into their pockets and support the Institution which, if more money were forthcoming, might be placed on as satisfactory a footing as similar institutions were in Europe and America. Eventually the motion was thrown out, and not only was the unfortunate situation saved by the able Chairman of the Institute and the distinguished leader of the Corporation, but much of the erroneous impression of the public as regards the aim and object of the teaching of the Institute and its most urgent wants was removed.

The time now appeared suitable to set out the wants of the Institute and to appeal to Government and the public for monetary support in order to enable the Board to undertake the development

Developments and extensions which were urgently necessary. In considered.

deciding upon the details of the scheme of improvement and development, considerable help was expected from the long experience of the Principal Mr Monie, but owing to his sudden death the brunt of the important and difficult task fell upon the Chairman Mr. Dunn, the Hon. Secretary Mr. Moos and the Ag. Principal Mr. Dawson. Mr. Monie had given many years to the service of the Institute, which he had joined some months prior to its formal opening in April 1890, and had conducted the duties of Principal for nine years with energy and ability.

He was very popular with the students and the staff, Mr. Monie's and he was the author of some very useful books, death. dealing with engineering and textile subjects.

The appointment of a successor to the late Mr. Monie was a matter that engaged the anxious consideration of the Board. The appointment was made in November 1905, and the new Principal arrived early in December 1905. During the nine months which intervened between the date of Mr. Monie's death and that of the arrival of his successor,

Mr Dawson was in charge as Principal. His tenure of office was marked by great zeal, energy and ability. He co-operated loyally with the Board in initiating some very

Mr. Dawson as
Ag. Principal.

important administrative and disciplinary reforms, and rendered the Trustees considerable assistance in increasing the utility and the scope of the Institute. At his suggestion the Board reserved to themselves the power to reject boys who may be physically unsuited for the work expected of them at the Institute or who may be likely to drop away before

Reforms in completing their course owing to pecuniary reasons.
1905.

Power was also reserved by the Board to remove, on the recommendation of the Principal, any student who may appear to be unlikely to profit by the training given. The Gymkhana was placed under the direct control of the Principal and its membership was made compulsory on all students. A Dormitory Superintendent was appointed to ensure cleanliness and orderly behaviour on the part of the resident students. For the benefit of the members of the Staff the establishment of a provident fund was suggested. On the educational side the programme of Class Work and Workshop Practice was carefully revised, and in view of the importance attached to the practical part of the training in the students passed out, the qualifying percentage of marks for a certificate was raised from 33½ to 40.

At the instance of the Ag. Principal, the establishment of a Central Electric Power Station was undertaken. The engines which supplied power to the different departments were neither large nor of recent construction. This was a serious defect, and multiplicity of small engines did not allow of that thorough practical instruction which is effectually convenient on a large experimental engine. Through Mr. Dawson's influence, Messrs. Babcock and Wilcox, the well-known firm of Boiler-makers, made to the Institute the free gift of a large water tube boiler of the latest type, a present for which the Board are extremely grateful. Mr. Dawson was also able to secure, on very favourable terms, an oil engine from Messrs. Botlihoi & Co., Agents to Messrs. Hornby & Sons, and a large Compound Horizontal Engine from Messrs. Marshall & Co. The development of the Mechanical, Electrical and Textile Departments was also considered, and schemes were formulated for giving effect to the improvements and developments which were urgently necessary.

The Chairman was greatly impressed by the fact that owing to the increase in the number of students it was impossible with the existing lathes and machine tools for each student to obtain the amount of actual practical work which he might otherwise get, and he accordingly conceived the idea of a special subscription from millowners and others directly interested in the quality of the students turned out to enable the plant to be adequately supplemented, and he himself gave a lathe as a present to the Institute.

Mr. Dunn also considered it most desirable that the Institute should be able to provide clean and wholesome accommodation, so that the students may not be forced to live in all manner of insanitary quarters amid undesirable surround-
Residential quarters.

ings just at that period of their life when they are most easily led astray and when undesirable habits are easily formed. The Chairman looked upon this as a most pressing call on the Board and had under consideration proposals for a suitable hostel to accommodate 200 students.

By the efforts of the Honorary Secretary, the School for Metal Working and Enamelling was placed in a position to undertake, once more, the instruction of students. For the enamelling branch the Institute was able to secure the services of Mr. A.S. Kotibhasker, M.A., a Chancellor's Medallist in Chemistry of the Bombay University, who, after three months of experiment, was able to successfully undertake the enamelling of iron sign plates and certain kinds of holloware. For the Enamelling improved, Sheet-metal Working Department the Board engaged the services of Mr. D.A. Gair, an L.M.E. of the Institute, who had been carrying on a successful metal work factory in the city for some years. Eleven students joined the classes, in which there was room for not more than 20. Mr. Kotibhasker had been engaged for his attainments in Chemistry and he was to be confirmed in his appointment of Enamelling Master and Lecturer in Chemistry on his succeeding in finding out the mixtures used in enamelling within a period of six months. He had not only found the mixtures within three months of his appointment and had successfully executed some orders, but was anxious to be able to show equally good results in the new Department of Chemistry, detailed proposals for the establishment of which had been called for by the Board and were then under discussion between the Acting Principal and him.

At this stage the now Principal, Dr. John E. Mackenzie, D.Sc. (Edin.), Ph.D. (Stras.), arrived and took over charge of the office of Principal from Mr. T. S. Dawson, who, as H.E. the Governor Lord Lamington observed at the distribution of awards held on the 6th March 1906, had been able to do so much during his short tenure of office as Acting Principal and to bring the Institute on a plane on which Dr. Mackenzie would have to extend his operation further. Mr. Dawson was appointed Vice-Principal in recognition of the valuable services he had rendered as Acting Principal, and it was expected that in that position he would be able from his local knowledge and experience to afford valuable assistance and guidance to the new Principal. The Director of Public Instruction, the Hon'ble Mr. Giles, who had been nearly ten years at the head of the Department of Education and had administered it with conspicuous success, was confident that the Institute 'was never since its inception in a more satisfactory condition and never more worthily deserved the confidence and support of the public than it did at this period.' There was an industrial awakening in the country which considerably enhanced the demand for admission to the Institute. In the Hon'ble Mr. G. Owen Dunn the Institute had a most able, sympathetic and tactful Chairman, who gave to its interests freely and ungrudgingly his valuable time. In Mr. Moos they had a Secretary whose zeal for and devotion to the welfare of the Institute was marked.

Dr. Maekenzie
the new Principal.

The other Trustees were all eager to help as far as it lay in their power in the development of the Institute on right lines. On the Staff the Principal had for his colleagues and assistants men whose work had amply proved their ability and suitability for the posts they occupied and whose devotion to duty was beyond question. The students as a class were intelligent and desirous of turning their opportunities to the best account. In short, the extraneous elements necessary for success were all available for Dr. Mackenzie at the outset of his career as Principal. His services had been engaged specially in view of the establishment of a department for training students in Chemistry applied to arts and manufactures generally and particularly to the textile industry, and he was asked to submit proposals for the consideration of the Board.

The Honorary Secretary supplied the Principal with the necessary details and assisted him in formulating a workable and acceptable scheme for the new Department which was

Chemistry Section. in due course sanctioned by the Board. It included the provision of a Laboratory building to accommodate 50 students for practical work at one time and a three-years' course was instituted, intended to give the first-year student a sufficient acquaintance with chemical phenomena to enable him to follow up specialization of chemical work in the second year to the particular requirements of the Textile or other Departments of the Institute, while in the third year he would have sufficient knowledge imparted to him of qualitative and quantitative analysis to fit him to undertake analytical work as applied to Textile Manufacture. The scheme also provided for the construction of a shed for the proposed Sizing, Bleaching and Finishing Section and for the instruction of electrical and textile students in the general principles of chemistry applicable to those branches. Four students joined the new Department, and, pending the construction of the new building, temporary arrangements for instruction of the students were made by utilising a portion of the Enamelling School. Dr. Mackenzie did not, however,

long remain in the post of Principal. The conditions of the post were not congenial to him, and he was allowed to sever his connection with the Institute from the 28th September 1907 within two years of his joining it.

Mr. Dawson was again appointed to act as Principal, and the office of the Vice-Principal, which became vacant in consequence, was conferred on Mr. L. du B. Hngo, B.A. (Cambridge and Cape), who had been selected ten months previously for the post of Head of the Departments of Physics

and Electrical Engineering in succession to Mr. Joyce, who died in August 1906 after a short illness. Mr. Joyce had served the Board faithfully for nearly four years, and to him was due the successful organisation of the new department of Electrical Engineering.

Before the appointment of Mr. Mackenzie as Principal, the Board had undertaken large and important schemes for the development of the Institute—schemes which involved a non-recurring expenditure of over Rs. 2,00,000 and an additional annual expenditure of nearly Rs. 25,000. They had decided upon exhausting all their available resources in order to meet the heavy cost and had appealed to Government and the public for support. The Chairman had conceived the idea of special subscriptions from mill-owners and others. This was taken up by the Honorary Secretary, and he was able within a short time to collect over Rs. 15,000. Government generously promised a contribution of Rs. 1,00,000 and the Board decided upon providing Rs. 1,10,000 out of their investments. With the necessary funds thus assured, an almost simultaneous beginning was made in effecting the several improvements early in 1906.

At the instance of the Chairman, Messrs. Marsland, Price & Co., were asked to design a suitable building for residential quarters for about 200 students with separate cook and dining rooms. The design was revised and improved by the Chairman and the Architect, and the buildings were completed in October last (1907). The total cost exclusive of the value of land has been about Rs. 1,00,000. The buildings which cover an area of about 230 ft. \times 40 ft. consist of two four-floor blocks with bath and W. O. accommodation in the

New Students' quarters
centre and a separate block of cook and dining rooms in front, and they are built throughout in reinforced concrete. They contain 96 well-lighted and ventilated rooms, 14 ft. \times 12 ft., with verandas in front and with access from a central passage. On each floor there is in addition one small room facing the staircase. The roof is flat and holds large storage tanks intended to provide a regular supply of water to the residents. The separate block of cook and dining rooms provides three large cook-rooms and an equal number of dining halls, separated by a central passage and a general larger hall intended to serve the purpose of a common meeting place for the students. At all stages in their erection, these fine quarters received the special attention of the Chairman, and, thanks to his interest and experience, they should prove a most valuable addition to the Institute.

The scheme for the Central Power Station was carried out by the Vice-Principal, Mr. Dawson, who had conceived it, and thanks to his untiring energy the station was in full operation in February last, and has since supplied power to the various departments of the Institute. The design of the building and chimney, their supervision during erection, the setting of the engine and boiler, and the arrangements of the shafting, dynamics, etc., were all attended to by him. He had imbued his students with much of his

Central Power Station.
enthusiasm, so much so that they sacrificed vacations and holidays, came early and stayed late to have the privilege of assisting in the erection of the plant. The station was formally opened by His Excellency Lord

Lamington on the 20th February 1907, in the presence of a large gathering who had assembled to witness the ceremony in response to the invitation of the Chairman and Members of the Board of Trustees, and were accommodated in a prettily decorated *shamiana*, put up for the occasion. The Hon'ble Mr. G. Owen Dunn, the Chairman, in requesting His Excellency to open the station among other things observed: 'I desire to offer to your Excellency our warmest thanks for your kindness in consenting to preside here to-day to inaugurate this Central Electric Power Station—the first of its kind we believe in India and probably the first in any Technical Institute—which we have established for the more efficient and economical working of the machinery of the different departments, and for the practical instruction of the students in the most modern types of steam and electric plant. Hitherto the departments of the Institute have each been driven by its own small steam engine of a type now out of date. Each required its own driver and fireman, and they were large consumers of fuel. In future the whole of the shafting in all the departments will be driven from this Central Station. One driver and one fireman only will be necessary, and the coal consumption is likely to be little more than half what it formerly was. But important as this is, it is the very great value of this installation for instructional purposes and the greater efficiency it will thus give to the Institute courses on which I desire to lay special stress. And in this connection I venture to express the hope that Government will now see their way to exempt the students of this Institute from the additional twelve months' apprenticeship which they are now called upon to go through after completing their three years' course here before they can appear for the examination for the Second Class Certificate under the Boiler Act. We already look upon it rather as a grievance that this extra 12 months is required of our students, for we undoubtedly offer here facilities for practical instruction which would justify an exception being made in our favour. Now, however, that we have this up-to-date plant and can make the students familiar with the most modern practice and appliances, there is, I think, no reason why we should be placed in the same category in this matter with other institutions which are not in a position to offer a tithe of the advantages.' The Chairman then asked his Excellency to accept the silver key with which to open the door of the Station and requested him to set in motion the engine and dynamo and switch on the electric current to the different departments.

Having done this, his Excellency the Governor in the course of his remarks, complimented the Board on the establishment of the station and observed:—

'It is certainly reasonable to hope, considering the good and thorough training received here in regard to Mechanics, that Government should relieve those who pass out of this building of the necessity of having a further apprenticeship of 12 months in some factory. I can only suggest that an application should be made to Government, and so far as the facts

brought to my notice go, I think there is every reasonable expectation that the concession may be granted.

'It is very gratifying to me to come here, and I am very glad to see a new enterprise of this description carried on, as it is by the efforts of private individuals. And I may add that it is very pleasant to me to come to an Institution that is not directly managed by Government and yet is so very much alive and up-to-date. Mr. Dunn has, I know, done his best for this Institution, and I can only re-echo his words in wishing success to the Victoria Jubilee Technical Institute, and I hope it will develop its efficiency from year to year and maintain its foremost position in this Indian Empire.'

In the Sir J. J. School a new Pattern Shop, designed by the Architect from particulars supplied by the Vice-Principal, was undertaken. This has just been completed and will provide ample room for this branch of the Workshops.

An important addition to the Textile Department has been made in the erection of a Weaving Shed, and thanks are due to Messrs. Platt Brothers, the well-known Manufacturers of Oldham, for their promise to bring the machinery in the Textile School up-to date, free of cost, and to provide new machinery for the extension of the school on liberal terms.

In addition to the expenditure on buildings, the Board expended large sums in adding to the equipment of the departments of Mechanical Engineering, Electrical Engineering, the Textile Manufacture and Technical Chemistry.

The large additions and extensions made necessitated an increase in the staff who were to assist the Heads of Departments in carrying out the elaborate programme of work. The appointment of a Head Assistant to each Head of the Department was therefore decided upon and Fellowships were instituted whereby the pick of successful students might gain useful practical experience besides giving assistance to the teachers in the departments in which they graduated.

It was however necessary, in order that all the developments and improvements may have the fullest scope of usefulness conducing to a maximum of efficiency, to supplement them by a thorough revision of the courses of instruction in the different departments, and thanks to the interest of the Chairman, Mr. Dunn, and the Hony. Secretary, Mr. Moos, the accomplishment of this much needed reform completes the history of the last of the twenty years of the Institute with which this record has to deal.

These improvements and developments will enable the Institute to maintain its premier position amongst the institutions for Technical

Education in the country for several years to come, and it only remains for the present to watch and mark the progress from time to time.

During the twenty years of its existence the Institute has afforded the benefit of technical education to over 4,000 young men, and of these 531 have passed the final examinations obtaining the full Technological Certificate. There is every reason to believe that most of them have obtained suitable employment, despite adverse circumstances. A number of them has passed the Second Class Boiler Act Examination and there are several who hold the First Class Certificate under the Boiler Act. The Institute has provided teachers and superintendents for most of the Technical and Industrial Schools in the country, and it may be interesting to note here, that for some years past the First Assistants in the Institute have been its passed students. The Institute has also trained some young men who carry on their own professions or trades. A few of the older students have distinguished themselves in the department of original work. Mr. H. F. Dastoor, L.M.E., Superintendent of the Surat School of Art and Industry, has invented an arrangement for the instantaneous fixture of the hydrants, air boxes, etc., upon pipes of water works, which has been the means of saving a large expenditure to the Municipality of his City and for which he has obtained a patent. Mr. Dastoor has also designed and constructed push cocks to prevent waste of water for the Surat and Rander Municipality. Mr. V. A. Talchalker, L.T.M., L.M.E., of the Institute, who has been for some years Manager of a Cotton Mill, has designed and carried out a successful process in Cotton Spinning, for which he has obtained a patent. Two of the passed students, Messrs. Dastoor and Bharucha, have written in Guzerati useful books on Engineering and Mill Work, while Mr. Talchalker has been a fairly regular contributor to a trade journal. Doubtless there are some others who have done likewise. Instances are also available of students who have been successfully employed not long after leaving the Institute on erection works, in Ice and Telephone works, and even in the Marine Department. In the principal department of employment, namely Mills and Factories, connected with mechanical industries, it may be interesting to note that the Pulgaon and the Lahore Mills were in 1904 (subsequent information is not available) entirely managed by passed students of the Institute in the various departments of Mechanical Engineering and Cotton Manufacture. Obviously it is impossible to keep in sight all the students who leave and obtain employment, but the representative record above given will suffice to show that the Institute can well claim to have been successful. In this respect the tables prepared from information collected in 1904 and appended to this record may be found interesting.

During the twenty years the average annual income of the Institute aggregated Rs. 70,000 including the Government grant of Rs. 30,000, the Municipal contribution of Rs. 10,000, the Millowners' donation of Rs. 3,000, the fees from students, sales of articles made and the interest

on investments Rs. 27,000, while the expenditure on salaries, stores, insurance, advertisement and other charges of maintenance has been on an average about Rs. 68,000 per annum. The figures divided by the average annual number of pupils in attendance—200—give an average annual cost per pupil of about Rs. 350. On Capital Account there have been received in money or money value Rs. 5,36,000 exclusive of the Rs. 3,00,000 which represented the value of the buildings and premises donated by Sir Dinshaw Manockji Petit, and of this sum Rs. 3,11,000 have been expended on new buildings, additions and modifications of buildings and on machinery, tools and apparatus, leaving a balance of Rs. 2,25,000, which is invested in securities. There have been also received sums aggregating Rs. 75,200, the interest on which is applied to the awards of Scholarships, Prizes, etc. The staff has been considerably strengthened and provision has been made for training a certain number of successful students for the profession of Technical Teachers. The scope of usefulness of the Institute has been extended by the addition of new departments which are full of promise. Even the comfort and convenience of the students have been provided for without, in any way, affecting the arrangements for a high class training which has enabled the Institute to maintain its position as the premier Technical Institute in the country and which cannot fail eventually 'to give to His Majesty's Indian subjects those industrial advantages which their fellow-subjects in England enjoy and which will tend to develop Indian industries and the exchange of Indian and English manufactures, stimulating the trade of both parts of the Empire and increasing the ties by which they are becoming more united daily.'

APPENDIX III.

THE DATE SUGAR INDUSTRY OF THE 24-PARGANAS.

BY BABU ANNADA PRASAD GHOSE,

Commercial Intelligence Department, Calcutta.

INTRODUCTION.

Next to agriculture, manufacture of date sugar is the largest village industry in the District of the 24 Parganas and it is also the oldest.

SOIL.

The soil for date cultivation should be saltish. Such soil, if it be high, moist and capable of easy draining, is suitable for the cultivation.

PLANTATION.

The dates are sown in regular rows in July, the seeds being deposited 9 cubits apart. After six months the seeds germinate and small plants

just like young grass come forth. The land should be ploughed over in October and care should be taken that no weeds grow to stagnate the growth of the plants. In six years the plantation becomes ready for use.

TAPPING.

Then tapping of the date tree begins in October when the juice-collector climbs to the top of the tree and supporting himself by a rope which passes round the tree and his loins, cuts off ten or twelve of the lower branches on one side of the tree and thus lays bare a flat surface about 9 inches square. In the next fifteen days the surface of the cut surface is usually scraped twice. Then a v-shaped longitudinal cut is made in the centre of the exposed surface and a small thin bamboo stick about 9 inches in length is driven just at the angular point of the cut. Beneath the end of the stick an earthen pot is hung at evening and the juice of the tree runs down into it. The juice is extracted three days in succession and then the tree is allowed to rest the following three days when again the juice is extracted and so on till the middle of February.

GUR-MAKING.

In the morning the juice pots are taken down. The collected juice is then boiled in large vats placed on a line of ovens, in which a brisk fire is kept burning, the fuel used chiefly being the branches that are cut from the trees. The juice which was originally limpid, becomes, in an hour, a brown semi-solid mass called Gur. It is, then, poured into small earthen pots (*Kalsi*) which are kept in a dry place.

REFINING OF GUR INTO SUGAR.

After two days the Gur is subjected to refining. The contents of the pots are emptied into big baskets which are kept over large open pans. Placed thus for ten days the liquid portion of the Gur drops through the baskets into the pans beneath, leaving a partially white solid mass which is nothing but sugar. To carry on the process successfully the tops of the masses (contained in the baskets) are covered with a certain aquatic seed called *saola* (native name) which keeps up a continual moisture and thus helps in separating the sugar from the molasses that collects in the pans. The sugar thus extracted is moist and is therefore, exposed to the sun. When dried it weighs about one-fourth of the original quantity of Gur.

COST PER BIGHA.

(a) Six years' cost of getting the plantation ready for use may be calculated thus :—

				RS.	S.	P.
Cost of sowing seeds	...	...	...	1	0	0
Six years' cost of ploughing and weeding			...	18	0	0
Six years' rent	...	...	...	30	0	0
Total (a) ...				49	0	0

(b) Cost of annual tapping and gur and sugar-making may be calculated thus:—

	Rs.	A.	P.
The wages of a juice collector for 4 months ...	48	0	0
Cost of employing a man for making gur and sugar ...	24	0	0
Earthen pots	5	0	0
Fuel	10	0	0
Extra expenses	4	0	0
Annual rent	5	0	0
Cost of ploughing and weeding	3	0	0
Total (b) ...	Rs. 99	0	0

So the grand total cost comes to Rs. 148.

OUTTURN.

The average yield of juice of one tree is 4 seers per tapping night. The total number of tapping nights in the tapping season being 60, the produce of juice per tree in the tapping season is 240 seers, which give 30 seers of gur, 8 seers of juice being equivalent to one seer of gur. So, a bigha containing 100 trees will therefore yield 3,000 seers of gur which generally yield

	Rs.	A.	P.
750 seers of sugar with a value of	140	10	0
and 2,250 seers of molasses „ „	281	4	0
Total value Rs.	421	14	0

Therefore the net profit of the 1st year's tapping is Rs. 273-14. It is to be noted that in each succeeding year the total cost will be less by Rs. 49 (cost of sowing seeds, six years' rent and cost of ploughing and weeding) and consequently the net profit in each succeeding year will be Rs. 273-14 plus Rs. 49, that is to say Rs. 322-14, a fair profit indeed.

CO-OPERATIVE CREDIT MOVEMENT IN INDIA.

ITS PROGRESS AND DEVELOPMENT.

The following Note has been prepared by Babu Jogendra-Nath Samaddar, F.R.H.S., Professor, P. M. College, Tangail, Mymensingh District.

The Societies started under the auspices of the credit movement in India may be classified into 3 classes, viz., (1) central societies lending to other societies only, (2) urban societies and (3) village or rural societies.

General progress.—The general progress is marked, although, as the Hon'ble Mr. Carlyle observed in his presidential speech at the Conference of Registrars of Credit Societies—'little impression has been made on the enormous burden of agricultural indebtedness in India, but a stage had

been reached at which serious work was being done and satisfactory progress being made.'

General statement :—

	30th June 1907.	30th June 1908.
	No of Societies.	No of Societies.
Central	14	7
Urban	89	149
Rural	740	1,201
	Number of members	Number of members.
	90,834	148,928
Amount of Capital.	Rs. 2,371,683	Rs. 4,407,026

The apparent decrease in the number of Central Banks is due to a change in classification in the United Provinces. But their capital had risen in round numbers from Rs. 164,000 to Rs. 232,000. The number of urban banks has risen from 59 to 149, the number of members from 33,600 to 55,500 and their capital from Rs. 11,36,000 to Rs. 20,09,000. As against 740 Rural Societies, there are now 1201 and the number of members has increased from 54,500 to 93,200, while the working capital has risen from Rs. 10,72,000 to Rs. 21,66,000. In fact the grand total of working capital of Co-operative Societies in India now amounts to 44 lakhs of Rupees. In view of the fact that this progress—a very marked one—is due to the activity of the Registrars of Co-operative Credit Societies of all the Provinces, they as well as our Government may justly feel proud of this infant institution which is working wonders. Here are particulars regarding each class :

CENTRAL.

The number at present is 7, with 1 in Madras, 2 in U. P., 4 in C. P., with a complement of 230 members and a working capital of 231,814. The payment from shares is Rs. 18,194, entrance fees amount to Rs. 106 and the members have deposited Rs. 126,016. Government has advanced Rs. 7,900, non-members have advanced Rs. 51,446 and with other items, the grand total of receipts reach Rs. 279,274. The grand total of expenditure including loans to members, payment of advances by Government, etc. amount to 266,732, thus leaving a closing balance of Rs. 1,254.

URBAN.

The progress has been very satisfactory. Societies have a working capital of Rs. 20,09,090 as against 11,36,225. In Madras we have 28, Bombay has 46, Bengal possesses 19, U. P. has 19, Punjab 5, Burma 9, Eastern Bengal and Assam 21, and the Central Provinces 7.

The payment from shares is Rs. 201,552, the entrance fees amount to Rs. 8,862. The members themselves have deposited Rs. 450,842. Government has lent Rs. 286,100 and from other items such as loans paid, interest received, etc., the grand total of receipts is Rs. 35,181,159.

Amongst the items of expenses, loans repaid amount to Rs. 498,429, the members have received loans to the value of Rs. 1,475,647. Loans to

the Societies amount to Rs. 484,456 and the grand total of expenditure amounts to Rs. 33,05,196 leaving a closing balance of Rs. 212,958.

RURAL.

There are at present 77 in Madras, 99 in Bombay, 331 in Bengal, 166 in U.P., 253 in Punjab, 72 in Burma, 114 in E. B. and A., 69 in C. P., 12 in Coorg, and 8 in Ajmeer. The Societies have a complement of 93,178 as members against 54,459. The payment from shares amounts to Rs. 211,691, the entrance fees to Rs. 18,165, deposits by members to Rs. 208,340. Government has advanced Rs. 247,529, interest received amounts to Rs. 1,24,691 and the grand total of receipts from all sources amounts to Rs. 28,99,623. The Disbursements including loans repaid, amount to Rs. 2,76,574, loans to members Rs. 22,02,032, total Rs. 218,952.

ASSETS AND LIABILITIES.

The Assets exceed the Liabilities by Rs. 3,817 in Central, Rs. 98,187 in Urban, and Rs. 133,425 in Rural Societies.

Here is an opportunity for all to invest in these Societies. There is a sure return and no risk.

APPENDIX IV.

List of Delegates to the Fourth Indian Industrial Conference, Madras, 1908.

1. Deputed by the Government of Madras.—Alfred Chatterton, Esq., Director of Industries, Madras.

2. Elected by the National Fund and Industrial Association, Madras.—Dewan Bahadur K. Krishnaswami Rao, C.I.E., Dewan Bahadur P. Rajaratnam Mudaliar, C.I.E., Rao Bahadur M. Adinayanaiah Iyah, Mr. N. Subba Rao Pantulu, the Hon'ble Nawab Saiyid Muhammad Saheb Bahadur, the Hon'ble Mr. V. Krishnaswami Iyer, Messrs. G. Subramania Iyer, P. Lakshmi Narasu Naidu, D. V. Hanumantha Rao, N. Pattabhirama Rao, S. Kasthuriranga Iyengar, O. Srinivasa Chariar, Dewan Bahadur L. A. Govindaraghava Iyer, the Hon'ble Mr. P. S. Sivaswami Iyer, C.I.E., Mr. V. Ryrum Nambiar, the Hon'ble Mr. P. Theagaraya Chettiar, Messrs. Dharamsey K. Asher, V. Arunagiri Naidu, Rao Saheb Govindadas Chaturbhujdas, Messrs. Nalam Venkatarathnam Chetti, Nalam Lakshmi Rathnam Chetti, K. R. Subramania Sastri, C. Tirumalayya Naidu, Rao Bahadur S. Subramania Iyer, Messrs. T. V. Seshagiri Iyer, P. N. Raman Pillai, G. A. Natesan, P. R. Sundara Aiyar, Pandit D. Gopalachari, Messrs. T. Ghansham Singh, A. O. Parthasarathi Naidu, S. Viraraghava-chariar, V. Gopalachariar, T. Rangachariar, Rao Bahadur M. Venkataswami Naidu, Messrs. S. Rajagopalachariar, P. N. Muthuswami Naidu, Gopinatha Tawker, K. B. Ramanatha Iyer, K. Narayana Rao, S. Gopalaswami Iyengar, T. V. Gopalaswami Mudaliar, A. S. Balasubrahmani Aiyar,

T. S. Natesa Aiyar, M. R. Ramasesha Aiyar, G. Venkataranga Rao, P. Duraiswami Mudaliar, V. Visvanadha Sastriar, C. Gopal Menon, Vidya Sagar Pandya, A. Ahmad Husain Saheb, G. A. Vaidya Rama Iyer, Rao Saheb T. Numberumal Chetty, Rao Bahadur N. O. Rajagopalachariar, Messrs. Mahomed H. Badshah Saheb, T. Ramachandra Rao, T. Rajagopal Pillai and T. V. Ramanuja Iyengar.

3. By the Industrial Association, Proddutoor.—Messrs G. Venkataramiah, K. Krishna Rao, J. B. H. Venkata Rao and T. K. Anantha Chariar.

4. By the People's Association, Coimbatore.—Messrs. T. V. Sanjiva Rao, K. V. Srinivasa Iyer, M. G. Arogiasawmi Pillai, K. Narayana Sastriar, C. V. Rangaswami Iyengar, C. S. Sambamurthi Iyer, C. V. Venkataramana Iyengar, M. Sambanda Mudaliar, C. R. Venkatachariar, S. Srinivasa Raghava Chariar, P. N. Krishnaswami Iyengar, K. P. Padmanabha Rao, N. S. Ramaswami Iyengar, C. H. Subramania Mudaliar, S. Ratnasabhapati Mudaliar, N. Giriah Chettiar, C. Verivada Chettiar, N. Kolandavelu Pillai, K. R. Subramania Iyer, Sesha Aiyar of Palghaut, P. M. Chakrapani Chettiar, S. Srinivasa Mudaliar, M. V. Minakshi Sundaram Mudaliar, P. H. Govinda Singh, E. S. Subramania Puttamally, S. Lakshmi Narasimha Aiyar, K. Anantha Subramania Iyer, N. Srinivasa Chariar, T. A. Ramalinga Chettiar, V. S. Ramaswami Iyer, C. S. Ramaswami Aiyar of Dharapuram, C. Venkatarama Iyer, C. R. Kalyanasundara Aiyar, and C. A. Venkata Krishna Aiyar.

5. By the Anjuman-i-Islam, Madras.—Khan Bahadur Waljee Laljee Sait, Mr. A. Ahmed Hussain and Haji Mir Abbas Ali Saheb.

6. By the People's Association, Negapatam.—Messrs. V. P. Pakiriswami Pillai and K. S. Venkatarama Iyer.

7. By the Central Agricultural Committee, Madras.—The Honourable Mr. P. Theagoraya Chettiar and Rao Bahadur M. Adinarayana Iyah.

8. By the Ganjam District Association, Berhampore.—Messrs. W. L. Venkataramiah, G. Raghava Rao, N. Ramanujaswami Pantulu, T. Pattabhiramayya, T. V. Narasinga Rao, A. V. Subbarao Pantulu, Rao Bahadur P. Gopala Rao Pantulu, Messrs. N. V. Ramadas Pantulu, K. V. Ranganadhaswami Pantulu, W. V. B. Ramalingam Pantulu, N. S. Prasada Rao, P. Venkateswarulu Pantulu, V. V. Jogiah Pantulu, D. Viswanadha Rao, M. Gangarazu Pantulu, T. Venkata Krishnayya, S. V. Gopala Krishnamma, K. V. Narasiah Naidu, V. Suryanarayanamurti, J. Venkata Rao, K. Babu Rao Naidu, M. Krishnamurti, D. S. Dakshinamurti Sastri, P. Balakrishnamma, Babus B. L. Mittra and T. G. Banerjea, Messrs. Pulbala Venkata Ramanayya, Ayyagari Ramamurthi Pantulu and R. Gunriah Sastri.

9. By the South Indian Association, Madras.—The Honourable Mr. V. Krishnaswami Aiyar, Mr. P. R. Sundara Aiyar, Dewan Bahadur P. Rajarathnam Mudaliar, C.I.E., Mr. N. Subbarao Pantulu, Dewan

Bahadur L. A. Govindaraghava Aiyar, Messrs. P. Lakshmi Narasu Naidu, N. Pattabhirama Rao, G. A. Natesan, A. Panchapakasa Aiyar and L. A. Srinivasa Raghava Aiyar.

10. By the District Congress Committee, Nellore.—Messrs. T. V. Venkatarama Iyer, T. V. Ramaswami Iyer, M. Chengayya Pantulu, S. R. Arunachala Aiyar, V. Krishnaswami Rao Pantulu, Shaik Abdul Rahman Saheb, K. V. Raghavachariar, M. Rangachariar, A. Santanarama Aiyangar, M. Narasimbachariar, V. Rangareddi, Pulleti Penchalu Reddi, A. V. Krishna Rao, Vemulaganti Krishnaswami Rao, S. Ranga Rao, Y. Venkatachalam, R. Subbarayudu, V. Venkatasubbiah of Kavali, T. T. Apparao, B. Annaswami Aiyar, T. Shunmukham Pillai, S. Srinivasachari, V. Narasingha Rao, R. Lakshmi Narayana Reddy, K. Penchalu Reddi, B. Pattabhirama Reddi, B. Balakrishna Reddy, K. Adinaranarayana Reddi, G. Venkataranga Rao, D. Seshiah, O. Viraswami Chetti, A. Penchalu Chetti, P. Sriramulu Chetti, M. G. Kuppaswami Aiyar, and A. S. Krishna Rao.

11. By the Victoria Technical Institute, Madras.—Messrs. W. S. Hadaway and G. Narayanaswami Chetti.

12. By the District Agricultural Association, Tinnevely.—The Honourable Mr. K. R. Guruswami Aiyar, Messrs. N. A. V. Somasundaram Pillai, M. R. Ramakrishna Aiyar and N. Gopalaswami Iyengar.

13. By the Indian Merchants' Chamber and Bureau, Bombay.—Messrs. D. E. Wacha and A. Morbhoy and the Manager of the International Trading Co.

14. By the Industrial Company, Ltd., Conjeeveram.—Mr. T. E. Kumaravenkata Chariar.

15. By a Public Meeting held at Chittoor.—Messrs. L. A. Venkata Raghava Iyer and L. Srinivasa Raghava Iyer.

16. By the Chamber of Commerce, Madras.—The Honourable Mr. A. J. Yorke.

17. By the District Association, Tanjore.—Messrs. O. R. Lakshmi Varada Iyengar, O. K. Srinivasa Iyengar and R. Srinivasa Iyengar of Kumbakonam.

18. By a Public Meeting held at Vizagapatam.—The Honourable Mr. B. N. Sarma and Messrs. V. Jagannadham, B. Venkatapati Razu and P. L. Narasimham.

19. By the Bengal Technical Institute, Calcutta.—Dr. Rashbehari Ghose, C.I.E., Drs. Nil Ratan Sircar and Pran Krishna Acharya, Babus Basanta Kumar Bose, Pramotha Nath Sen, Satyananda Bose, Hemendra Nath Sen, Satyananda Bose, Prithwis Chandra Roy and Sudhir Kumar Lahiri, Mr. J. Ohaudhuri and Kaviraj Upendra Nath Sen.

20. By a Public Meeting held at Akola.—Rao Bahadur Deorao Vinayak and Mr. R. V. Mahajani.

21. By a Meeting at Ahmednagar.—Messrs. G. K. Obitale and G. Shrotrigar.

22. By the Anjuman-i-Islam, Bombay.—Messrs. Abbas S. Tyabji, Jaffer Rahimtoolah, M. A. Jinna, Kazi Kabiruddin and H. Yusouf H. Ismail.

23. By the Khandesh District Association, Dhulia.—Messrs. B. R. Kotwal, S. D. Garud, L. N. Ransing, S. N. Velhankar, B. R. Ransing, Kashinath Mulchand, Y. B. Buchalkar, G. G. Garud.

APPENDIX V.

Resolutions passed by the First, the Second and the Third Indian Industrial Conference.

THE FIRST CONFERENCE: BENARES, THE 30th DECEMBER 1905.

I.

That this Conference urges the Government of India and all Provincial Governments and Administrations, and also the people of India according to their opportunities,—

(1) To found technical schools in all large centres for the industrial education, on an adequate scale, of the Indian people;

(2) To encourage and help Indian manufactures;

(3) And to foster and extend the use of such manufactures in India in preference to foreign goods.

[Proposed by the Hon'ble Munshi Madho Lal (Benares), seconded by Mr. A. Chaudhuri (Calcutta), supported by Mr. N. Subbarao (Rajahmundry), and carried unanimously.]

II.

That this Conference urges all Provincial Governments and administrations as well as the proprietors and managers of private schools and colleges to add commercial classes, and industrial classes like those of weaving, dyeing, carpentry, etc., to the existing educational institutions, where practicable.

[Proposed by Mr. G. Subramania Iyer (Madras), seconded by Mr. Ali Mohamed Bhimji (Bombay), and carried unanimously.]

III.

That this Conference specially invites the attention of Indian capitalists to the great importance of introducing the use of improved hand-looms among the weavers of India, and recommends the establishment of weaving schools, where boys may learn the use of such looms, with a view to their more extended use among the towns and villages of all Provinces in India.

[Proposed by Mr. Prabhas C. Mitra (Calcutta), seconded by Mr. Babulal Govilla (Aligarh), supported by Mr. Fazlal Husain (Aligarh), and carried unanimously.]

IV.

That this Conference urges Indian capitalists to establish at their own cost schools for spinning, dyeing, pottery, carpentry, and the manufacture of ironware and brassware, in order to afford facilities to boys of all castes and classes to learn such useful industries as a means of their livelihood.

[Proposed by Rai Bahadur Lala Baij Nath (Allahabad), seconded by Mr. Rambhaji Dutt Chowdhri (Lahore), supported by Mr. S. R. Das (Calcutta), and carried unanimously.]

V.

That where it is possible to raise large funds for industrial education, this Conference recommends the placing of such funds in the hands of trustees with a view to the establishment of Technological Colleges on the most modern methods adopted in Europe, America and Japan, for the training of large numbers of students in the various industries which are profitable in India.

[Proposed by Sir Bhalchandra Krishna, Kt. (Bombay), seconded by Rai Sahib Lala Girdhari Lal (Delhi), supported by Mr. Sakhbir Singh (Muzaffarnagar), and carried unanimously].

VI.

That Provincial Committees be established at Calcutta, Bombay, Madras, Allahabad, Lahore and Nagpur for giving effect to the above recommendations, generally encouraging industries and making an industrial survey in their several provinces, and compiling useful facts and suggestions for submission to the next Industrial Conference in December 1906. In order to carry out these views each Committee is requested to raise suitable funds, appoint trustees, frame rules for the conduct of business and lay its accounts before the next Industrial Conference.

That the following gentlemen, with power to add to their number, be the members of the Committees for the year 1906:—

CALCUTTA.

T. Palit Esq.

The Hon'ble Mr. J. Chaudhuri.

R. N. Mukerji Esq.

BOMBAY.

D. E. Wacha Esq.

The Hon'ble Mr. Vitthal Das Damodhar Thackersey.

Lalubhai Samaldas Esq.

MADRAS.

N. Subbarao Esq.

The Hon'ble Mr. L. A. Govindaraghava Iyer.

V. Krishnaswami Iyer Esq.

ALLAHABAD,

Rai Bahadur Lala Baij Nath,
The Hon'ble Pandit Madan Mohan Malaviya,
Munshi Ganga Prasad Varma,

LAHORE.

Rai Bahadur Lala Ganga Ram, C. I. E.
Shaikh Umar Bakhsh.
Lala Lajpat Rai.
Lala Harkishen Lal.
Lala Mulka Ram.

NAGPUR.

G. S. Khaparde Esq.
Rao Bahadur R. N. Mudholkar.
M. V. Joshi Esq.

[Proposed by Lala Lajpat Rai (Lahore), seconded by Rai Bahadur Lala Ganga Ram, C. I. E. (Lahore), supported by the Hon'ble Mr. L. A. Govindaraghava Iyer (Madras), and carried unanimously.]

VII.

That this Conference appoints Mr. R. N. Mudholkar as General Secretary, empowers the President to appoint a permanent Assistant Secretary and establishment on suitable pay, and allots a sum of Rs. 5,000 for meeting the expenses for the next twelve months.

[Proposed by the Hon'ble Pandit Madan Mohan Malaviya (Allahabad), seconded by Mr. C. Vijayaraghavachariar (Salem), and carried unanimously.]

THE SECOND CONFERENCE: CALCUTTA, THE 29TH AND 31ST DECEMBER 1906.

I. TECHNICAL AND COMMERCIAL EDUCATION.

That this Conference re-affirms the Resolutions passed at the Conference of last year on the subject of Technical and Commercial Education, and requests the Government to establish a sufficient number of Secondary Technical and Commercial Schools, a superior Technical College for each Province, and one fully equipped first class College of Technology for all India. And that a Committee consisting of the President, the General Secretary, Messrs. R. C. Dutt, D. E. Wacha, G. V. Joshi, G. Subramania Iyer, Lajpat Rai, P. N. Bose, A. C. Sen, Deva Prasad Sarvadhikari, and Dr. Nil Ratan Sircar, be appointed to prepare a Memorial on the above lines for submission to Government by the President and the General Secretary.

[Proposed by Mr. V. Krishnaswami Iyer (Madras), seconded by Babu Deva Prasad Sarvadhikari (Calcutta), supported by Babu Ambica Charan Moitra (Pabna), and Mr. G. A. Natesan (Madras), and carried unanimously.]

II. THE INDIAN STORES COMMITTEE.

That this Conference conveys its thanks to the Government of India for appointing a Committee for making recommendations for the use by Government departments of indigenous articles in preference to foreign goods, and requests that they be pleased to direct the early publication of the Report of the Committee, so that the public and the trades in India may have an opportunity of considering it before final orders are passed on the subject.

[Proposed by Sir Bhalehandra Krishna, A.C. (Bombay), seconded by Mr. K. Natarajan (Bombay), supported by Moulvi Muhammad Nizamuddin Hassan (Lucknow), and carried unanimously.]

III. INDUSTRIAL SURVEY.

That in view of the importance of having an Industrial Survey of India made by Government, and having regard to the recommendation made by the Committee on Industrial Education to that effect, this Conference requests Government to make such a survey, and empowers the President and the General Secretary to submit a memorial on the subject.

[Proposed by Rao Bahadur R. N. Mudholkar (Amraoti), seconded by Babu Bipradas Pal Chowdhuri (Calcutta), supported by Mr S. C. Mookerjee (Calcutta), and carried unanimously.]

IV. SUGGESTIONS TO THE PUBLIC.

That this Conference specially invites the attention of the public to the great importance of introducing the use of improved handlooms among the weavers of India, of promoting technical education by the establishment of schools and classes, and of starting laboratories for the purpose of determining the industrial value of Indian products.

[Proposed by Dewan Bahadur Ambalal S. Desai (Ahmedabad), seconded by Mr. Viswanath P. Vaidya, (Bombay), supported by Dr. Nil Ratan Sircar (Calcutta), and Shet Damodardas Khivraj (Beawar), and carried unanimously.]

V. THE CONFERENCE PROVINCIAL COMMITTEES.

That the Provincial Committees already established be asked besides taking steps to promote industries in their several provinces, to compile useful facts and suggestions for submission to the next Industrial Conference, and to raise suitable funds for carrying on their work.

[Proposed by Dewan Bahadur L. A. Govindaraghva Iyer (Madras), seconded by Babu Ambica Charan Ukil (Calcutta), supported by Mr. A. Ramanna (Mysore), and carried unanimously.]

VI. APPOINTMENT OF OFFICE-BEARERS AND PROVISION OF FUNDS FOR THE YEAR 1907.

That this Conference re-appoints Rao Bahadur R. N. Mudholkar as General Secretary and Mr. C. Y. Chintamani as Assistant Secretary, and

empowers the President and the General Secretary to appoint an Additional Assistant Secretary and establishment on suitable pay, so that the Assistant Secretary may be free to visit the different provinces and help the Provincial Committees in all matters in which they may require assistance. And this Conference allots a sum of Rs. 10,000 for meeting the expenses for the next twelve months, and also for issuing a quarterly bulletin of industrial information under suitable management.

[Proposed by Mr. R. C. Dutt, C. I. E., (Baroda), seconded by Rai Bahadur P. Ananda Charlu, C. I. E. (Madras), and carried unanimously.]

THE THIRD CONFERENCE: SURAT, THE 30th DECEMBER 1907.

I. INDUSTRIAL SURVEY.

That this Conference expresses its sense of satisfaction that an Industrial Survey has been carried out in the United Provinces and is being carried out in the Central Provinces and Berar, and in the Baroda State; and it would urge other Provincial Governments in British India and the Governments of other Indian States to carry out at an early date Industrial Surveys of the territories within their jurisdiction, as exact and detailed information would afford facilities for the introduction of a sound system of technical education and the well-ordered development of indigenous industries.

[Proposed by Sir Bhalchandra Krishna, Kt. (Bombay), seconded by Mr. K. Natarajan (Bombay), and carried unanimously.]

II. TECHNICAL AND COMMERCIAL EDUCATION.

(a) That this Conference re-affirms the Resolution on Technical and Commercial Education passed at the last Conference.

(b) That this Conference thanks the Government of the United Provinces for the action taken by them with a view to introduce a fairly comprehensive system of Technical Education in those Provinces and would express the hope that other Provincial Governments will be pleased to convene representative conferences such as the recent Naini Tal Conference to devise measures for the spread of Technical Education in their respective provinces. And this Conference further expresses the hope that the Government of India would provide adequate funds for giving effect to the recommendations of the Naini Tal Conference and carrying out similar schemes in other provinces.

(c) That this Conference, while appreciating the action taken by the Governments of some Indian States to encourage Technical Education, urges that further steps should be taken in the same direction in all Indian States.

(d) That this Conference welcomes the growth of public interest in Technical Education as shown by the action taken by certain local and municipal boards and private associations in promoting it, and it strongly urges on the leaders of the people the necessity of taking practical steps for providing increased facilities for it by starting institutions and founding scholarships to encourage technical studies in India and abroad.

[Proposed by Mr. R. C. Whitenack (Baroda), seconded by Mr. D. G. Dalvi (Bombay), supported by Mr. Ishwar Das Varshini (Aligarh), and Professor Ruchi Ram Sahni (Lahore), and carried unanimously.]

III. AGRICULTURAL EDUCATION.

That this Conference records its sense of appreciation of the action taken and contemplated by the Government in regard to the establishment of Agricultural Colleges in the several provinces, and would urge that in view of the importance of a wider spread among the cultivating and landholding classes of a practical knowledge of the principles of scientific agriculture and modern methods, Government would be pleased to establish Experimental and Demonstration Farms as widely as possible and to start vernacular schools in connection with them one at least in every district.

[Proposed by Mr. G. Subramania Iyer (Madras), seconded by Rao Bahadur Khandubhai Gulabbhai Desai (Surat), and carried unanimously.]

IV. AGRICULTURAL BANKS.

That this Conference begs to call the attention of Government to the urgent need of promoting the establishment of Agricultural Banks to help co-operative credit societies and to advance loans directly to agriculturists at reasonable rates of interest, and further begs to suggest that the advice and co-operation of representative members of the Indian community may be enlisted in devising a suitable scheme to secure this object.

[Proposed by Rao Bahadur Lalshankar Umiashankar (Ahmedabad), seconded by Mr. Thakorram Kapilram (Surat), and carried unanimously.]

V. THE MINING INDUSTRY.

(a) That this Conference expresses its sense of satisfaction at the successful formation of the Tata Iron and Steel Company, Limited, with the help entirely of capital raised in India.

(b) That this Conference invites the attention of capitalists in India to the urgent need of developing and fully utilising the mineral resources of the country and trusts that in view of the ultimately lucrative character of the industry they will make organised efforts in that direction.

(c) That this Conference is of opinion that special consideration should be shown to Indian enterprise and initiation by the Government and preferential treatment given to it.

[Proposed by Rao Bahadur R. N. Mudholkar (Amraoti), seconded by the Honourable Mr. Gokuldas K. Parekh (Bombay), and carried unanimously.]

VI. COTTON SPINNING AND WEAVING.

(a) That this Conference records its sense of satisfaction at the stimulus the Spinning and the Weaving industry have received from the Swadesi movement and it urges the bestowal of increased attention on Cotton Cultivation, the erection of Spinning and Weaving Mills at suitable centres, and the revival of the Handloom Weaving industry on a commercial basis, as essential to the success of the movement.

(b) That this Conference urges the Government to remove the restrictions retarding the expansion of the industry and to provide facilities for affording practical instruction in weaving by the establishment of Weaving Schools at every important weaving centre.

[Proposed by Mr. L. K. Tulasiram (Madura,) seconded by Mr. S. B. Sankaram (Ellore), and carried unanimously.]

VII. THE SUGAR INDUSTRY.

(a) That this Conference notices with concern the increase in the imports of foreign sugar, and is of opinion that to arrest the steady decline of the indigenous industry it is absolutely necessary to encourage the cultivation of healthier and more prolific varieties of cane, to employ greater care in cultivation, to use more economical processes for extracting the juice, and, above all, to adopt the most modern and efficient methods of refining.

(b) That this Conference urges the Government to provide more extensive irrigational facilities, to allow the utilisation of bye-products, and further, to consider the desirability of imposing a duty upon imported sugar in order to protect the indigenous industry.

[Proposed by the Honourable Pandit Madan Mohan Malaviya (Allahabad), seconded by Mr. Manubhai Nandshankar (Baroda), supported by Lala Dharamdas Suri (Lahore) and Mr. Chunilal Vrijbhukandas (Bombay), and carried unanimously.]

VIII. APPOINTMENT OF OFFICE-BEARERS AND PROVISION OF FUNDS FOR THE YEAR 1908.

That this Conference re-appoints Rao Bahadur R. N. Mudholkar as General Secretary and Mr. O. Y. Chintamani as Assistant Secretary, and it appeals to the public for a sum of Rs. 10,000 for meeting the expenses for the next twelve months.

[Proposed by Sir Bhulchandra Krishna, Kt. (Bombay) seconded by the Honourable Pandit Madan Mohan Malaviya (Allahabad), and carried unanimously.]

REPORT
ON THE
WORK OF THE
Indian Industrial

Conference

INCLUDING A
RECORD OF GENERAL INDUSTRIAL ACTIVITY
IN THE TWELVE MONTHS

December 1907 to November 1908.

=====
Madras :

PRINTED BY THOMPSON & CO.,
AT THE "MINERVA" PRESS, 33, BROADWAY.

—
1908.

CONTENTS.

	PAGE.
Report on Industrial Conference Work	1
Accounts of the Conference	7
Report of the Assistant Secretary's Tours	14
"Government and Industrial Development	20
Industrial Activity of the People	43
"Correspondence between the Government of Bombay and the General Secretary	63
"Circular Letter to the Provincial Committees	66
Plantain Cultivation in Bengal	73
Agriculture and Industries of Jessore (Bengal)	75
New Joint Stock Companies	78

REPORT

OF

Industrial Conference Work

AND RECORD OF

**General Industrial Activity in the Country in the
Twelve Months ending with November 1908.**

PART I.

INDUSTRIAL CONFERENCE WORK,

December 1907.

1. The report submitted to the Third Indian Industrial Conference at Surat covered the thirteen months from November 1906 to November 1907. The work that engaged the office in the month of December 1907 was in connection with the last session of the Conference. The Assistant Secretary, Mr. Chintamani, spent almost the whole month at Surat to assist the local Committee in making arrangements for the Conference. The resolutions that were to be placed before the Conference were settled at a Committee meeting held on the 25th idem, and the Conference itself was held in the Congress pavilion on the 30th December under the presidency of Dewan Bahadur Ambalal Sakarlal Desai of Ahmedabad. A full report of the proceedings was issued in the month of October last.

January to November 1908.

2. By Resolution VIII of the last Conference Rao Bahadur R. N. Mudholkar and Mr. C. Y. Chintamani were reappointed General and Assistant Secretary respectively, and an

appeal was made to the public for a sum of Rs. 10,000 to meet the expenses of the current year. A little more than a third of this sum has been actually realised and consequently the Resolution of the preceding Conference that an additional Assistant Secretary should be appointed and a quarterly Bulletin of Industrial Information issued from the office could not be given effect to this year either.

3. The Assistant Secretary visited Bombay, Ahmedabad, Nadiad, and Poona in the Bombay Presidency ; Nagpur ; Calcutta, Pubna and Bankipore in Bengal ; Allahabad, Lucknow, Benares and Aligarh in the United Provinces ; Madras, Ootacamund, Coimbatore, Palghat, Calicut, Tellicherry, angalore, Salem, Vellore, Trichinopoly, Tanjore, Negapatam, Vizagapatam, Vizianagram and Chica-cole in the Madras Presidency ; Nagpur in the Central Provinces ; and Baroda, Mysore and Bangalore in the Indian States. He actively assisted in the organization of the first Bengal, Second United Provinces and First Behar Industrial Conferences, and served as a member of the Industrial Conference at Ootacamund at the invitation of the Government of Madras who had called it. Mr. Chintamani's account of his tours accompanies this Report as usual.

4. The General Secretary submitted the Resolutions of the Surat Conference to the Government of India and the various Provincial Governments. The Government of Bombay were pleased to publish a Resolution indicating their position in respect of the propositions adopted by the Conference. This, and the General Secretary's reply to it, are appended. (*Vide* Appendix I.)

5. A Handloom Competition was held at the Surat Conference as at the previous Conference at Calcutta and prizes of the value of Rs. 250 were awarded to the successful competitors. The report of the judges,—Professor T. K. Gajjar, Rao Bahadur Deorao Vinayak and Mr. L. K. Tulasiram—was published soon after the Conference. It will be found printed as Appendix I of the Report of the Surat Conference.

6. A prize of the value of Rs. 200 was offered at the All India Weaving Competition held at Madras towards the end of February, but as there was no loom which satisfied the conditions laid down it was not actually awarded. The Indian Industrial Conference was represented at the Competition and the Weaving Conference held in connection with it by Mr. Raoji Bhai Patel, of the Baroda State.

7. The whole of the second edition of the 'Directory of Indian Goods and Industries,' published in December 1907, having been sold out, and there being still more demand for copies, a third edition, revised and enlarged, has been prepared in the office. This is expected to be ready for issue to the public in the last week of December.

8. Another compilation made in the office is a Directory of Technical Institutions in India, in which is given full information of agricultural, industrial, technical, commercial, science, and art schools and colleges of British India and the Indian States. The heads of the institutions concerned and other officers who were in a position to supply the requisite information rendered willing assistance and to them grateful acknowledgments are due. The Directory is in the Press and will shortly be published.

9. Early in the year a communication was addressed by the General Secretary to the Provincial Committees on the work of the Conference (*vide* Appendix II).

10. The First Bengal Industrial Conference was held at Pubna on the 13th February under the presidency of Babu Ambica Charan Mazumdar of Faridpur. Resolutions were passed at it on Industrial Survey, Technical Education and the Swadeshi movement.

11. The Second United Provinces Industrial Conference was held at Lucknow on the 29th February under the presidency of Mr. A. C. Chatterjee, I. C. S., the able officer who has conducted the industrial survey of the provinces. The resolutions passed at this Conference related to Techni-

cal Education, Agricultural Education, Cooperative Credit and Hand-loom Weaving.

12. The First Behar Industrial Conference was held at Bankipore on the 14th April under the presidency of the Honourable Mr. Justice Syed Shurfuddin. Resolutions were passed at it on Technical Education, the organization of Capital, Hand-loom Weaving and the Sugar Industry. On the same occasion a meeting of the Behar Educational and Industrial Association was held at which a sum of nearly Rs. 20,000 was subscribed for awarding technical scholarships to the Behari youth.

13. The National Fund and Industrial Association, Madras, the Managing Board of which is the Madras Provincial Committee of the Indian Industrial Conference, organised, as already stated, an All-India Weaving Competition and a Hand-loom Conference towards the end of February. The Government of Madras rendered generous assistance to the Association and His Excellency the Governor distributed the prizes to the successful competitors. The Conference was presided over by the Honourable Mr. P. Theagoraya Chetty—himself the owner of a flourishing weaving factory at which improved looms are in use—and the several qualified men who met discussed various questions bearing on the development of this, the most extensive industry in India after agriculture.

14. It is encouraging to note that the proposals of the Conference in the matter of industrial survey and technical education are being gradually given effect to by more than one Government. Since the Conference last met, the industrial survey of the United Provinces has been completed. An industrial survey has been carried out in Bengal and it is being carried out in Eastern Bengal and Assam. The Government of Bombay have placed on special duty an expert in weaving to carry out a survey of the hand-loom weaving industry of that Presidency, and preliminary steps in connection with the survey in the Central Provinces and Berar have been taken. The operations in

the Central Provinces would, no doubt, have been completed by now had not the time and energies of Mr. C. E. Low, the officer who has been placed on special duty in connection with them, been entirely required by the organization of the Central Provinces and Berar Exhibition which was opened on the 12th November.

This Exhibition which is one of the best and most successful ones held in India will itself fulfil to no small extent the objects of an industrial survey. It is also valuable as a most satisfactory and encouraging example of a work of great public utility carried out without a hitch by a whole-hearted and loyal cooperation between officials and non-officials, Europeans and Indians.

Another Resolution of the Surat Conference respectfully urged the Provincial Governments to hold Conferences on the lines of the Naini Tal Conference of last year for devising suitable and adequate schemes for promoting technical education in their respective provinces. The Government of Madras recently held such Conference at Ootacamund, and His Honour the late Acting Lieutenant-Governor of Eastern Bengal and Assam declared in a public speech the intention of that Government to refer the whole subject to a committee after completion of the industrial survey by Mr. J. N. Gupta, I.C.S., the officer who is placed on special duty for the purpose.

15. India being a country of vast distances, and local needs and conditions varying to the extent they do, it cannot be in the very nature of things that one central body for the whole country like the Indian Industrial Conference can itself directly foster industries. Its chief usefulness is in the collection and dissemination of information and the stimulation of industrial activity in the several provinces and localities. That it has made an honest endeavour, and perhaps a not altogether unsuccessful one, in this direction is the opinion of those who have taken interest in its work. It is our conviction, however, that if the Conference is to be a progressively useful body, a great deal more has to be

accomplished than has yet been attempted. The Conference is the proper body to undertake work in several important directions which have been indicated on different occasions by its leading members. Men and Money are the *desiderata*. Unless men come forward to do sustained work in the provinces and districts, and unless more funds are placed at the disposal of the office-bearers, much urgently needed action cannot be taken and the desirable progress will remain to be made. We therefore venture earnestly to renew the appeal made in the last report for the active cooperation and substantial help of the public.

16. A record of general industrial activity in the country, including an account of the steps taken by the Governments of British India and the Indian States, is printed as Part II of the Report.

17. We desire to repeat our acknowledgments to the Supreme and Provincial Governments and the managers of periodical publications for their courtesy in supplying the Conference office with their reports and gazettes, journals and newspapers, free of cost.

18. We wish to place on record our appreciation of the very valuable work Mr. C. Y. Chintamani is doing and the great assistance he is rendering to the cause of industrial progress.

19. Statements of Receipts and Disbursements of the office of the General Secretary are published with this Report.

AMBALAL SAKERLAL DESAI,

AHMEDABAD, } *President,*
The 8th December 1908. } *Third Indian Industrial Conference.*

R. N. MUDHOLKAR,

AMRAOTI, } *General Secretary,*
The 30th November 1908. } *Indian Industrial Conference.*

Summary of Accounts of the Indian Industrial Conference for the month of December 1907.

Receipts.	Rs. A. P.	Disbursements.	Rs. A. P.
On "Directory of Indian Goods and Industries" Account	141 8 0	On "Directory of Indian Goods" Account ...	443 10 0
Donation by the Honourable Mr. Justice P. C. Chatterjee, C.I.E., Lahore (For Hand-loom Competition)	100 0 0	Pay of Assistant Secretary and other esta- blishment charges	200 0 0
Do by Bipradas Pal Chowdhuri, Esq., Calcutta...	50 0 0	Printing	103 9 0
Do by Nathabhai Lalubhai Vakilina, Esq., Surat..	25 0 0	Travelling Expenses of the Assistant Secretary	44 4 0
On "Report of the Second Indian Industrial Conference" Account...	20 0 0	Postage	21 4 3
		Telegrams	21 8 0
		Railway freight	18 0 0
		Stationery	6 3 0
		Binding	4 0 0
		Sundries... ..	1 12 0
Total	336 8 0	Total	864 2 3

AMRAOTI

R. N. MUDHOLKAR,
General Secretary,
Indian Industrial Conference.

The 16th January 1908.

Summary of Accounts of the Indian Industrial

Receipts.	Amount.		
	Rs.	A.	P.
Opening Balance	1,125	4	3
On "Directory of Indian Goods" Account	1,900	0	6
The Hon'ble Mr. Vithaldas D. Thackersey, Bombay	500	0	0
Seth Damodardasji Khemrajji, Banker, Beawar	500	0	0
R. C. Dutt, Esq., C.I.E., Baroda	250	0	0
The Hon'ble Mr. V. Krishnaswami Iyer, Madras	200	0	0
H. H. The Maharajah of Mourbhanj, Mourbhanj	200	0	0
Lalubhai Samaldas, Esq., Bombay	150	0	0
Rao Bahadur R. N. Mudholkar, Amraoti	150	0	0
Rai Bahadur Lala Baij Nath, Allahabad	150	0	0
Dr. Harold H. Mann, Calcutta	100	0	0
Messrs. Morarji Gokuldas & Co., Bombay	100	0	0
R. N. Mookerjee, Esq., Calcutta	100	0	0
R. Ramachandra Rao, Esq., Kurnool	100	0	0
Sir Bhattachandra Krishna, Kt., Bombay	100	0	0
Maharajah Manindra Chandra Nandi Bahadur, Cossimbazar	*100	0	0
The Hon'ble Mr. Gokuldas K. Parekh, Bombay	100	0	0
Rai Yatindra Nath Chaudhuri, Calcutta	100	0	0
Ghulam Ali Chagla, Esq., Karachi	100	0	0
The Hon'ble Pandit Sundar Lal, C. I. E., Allahabad	*100	0	0
The Hon'ble Mr. Justice P. C. Chatterjee, C.I.E., Lahore	*100	0	0
C. Vijayaraghavachary, Esq., Salem	50	0	0
A. Rangaswami Iyengar, Esq., Mysore	50	0	0
The Hon'ble Mr. H. S. Dikshit, Bombay	50	0	0
Harkishen Lal, Esq., Lahore	50	0	0
Vishwanath P. Vaidya, Esq., Bombay	50	0	0
Pandit Moti Lal Nehru, Allahabad	50	0	0
Dr. Tej Bahadur Sapru, Allahabad	50	0	0
N. Subbarao Pantulu, Esq., Rajahmundry	50	0	0
The Hon'ble Babu Jogendra Nath Mukerji, Purnea	50	0	0
S. N. Pandit, Esq., Rajkot	50	0	0
Dewan Bahadur Ambalal S. Desai, Ahmedabad	50	0	0
Mathuradas Ramchand Jhaveri, Esq., and Rao Bahadur Hiranand Khemsingh Advani, Hyderabad (Sind)	50	0	0
Dewan Bahadur L. A. Govindaraghava Iyer, Madras	50	0	0
N. M. Bedarkar, Esq., Amraoti	50	0	0
Bipradas Pal Chowdhuri, Esq., Calcutta	50	0	0
G. A. Natesan, Esq., Madras	30	0	0
C. Y. Chintamani, Esq., Amraoti	30	0	0
R. P. Karandikar, Esq., Satara	30	0	0
R. Muthukrishna Iyer, Esq., Pudukottah	25	0	0
Boikunt Nath Sen, Esq., Berhampore	25	0	0
Rao Bahadur Waman M. Kolhatkar, Nagpur	25	0	0
D. E. Wacha, Esq., Bombay	25	0	0

* For Hand-loom Prizes.

Conference for the year 1907.

Disbursements.					Amount.		
					Rs.	A.	
Pay of Assistant Secretary and other Establishment Charges	...	...	...	...	2,105	5	0
Printing	...	...	...	...	1,092	6	0
On " Directory of Indian goods " Account	...			...	995	7	6
On " Hand-loom Competition " Account	...			...	525	9	0
Travelling Charges of the Assistant Secretary, etc	...			...	454	13	6
Postage	...	...	...	...	125	11	3
Lost by theft	...	..	...	...	125	0	0
Telegrams	...	...	...	...	51	1	0
Stationery	...	...	...	...	43	13	0
Books and Papers	...	...	...	...	28	13	0
Railway freight	...	...	...	...	18	0	0
Binding	...	...	...	...	9	0	0
Sundries	...	...	...	...	9	14	0
Balance ..					5,584	13	3
					1,935	7	6
Total ..					7,520	4	9
<i>Expenditure incurred last year but amount still to be paid.</i>							
Hand-loom Prizes	...	...	...	Rs. 250-0-0			
On Directory and Annual Report Account etc., (approximately)	...			" 275-0-0			
				" 525-0-0			
Net balance (approximately)	...	...		" 1,410-7-6			
				" 1,935-7-6			

AMRAOTI,

The 17th January 1908.

R. N. MUDHOLKAR,

General Secretary,
Indian Industrial Conference.

Summary of Accounts, etc.—*contd.*

Receipts.	Amount.	
	Rs.	A. P.
I. N. Tagore, Esq., Calcutta	25	0 0
Krishna Rao Phatak, Esq., Nagpur	25	0 0
The Hon'ble Mr. P. S. Sivaswami Iyer, Madras	25	0 0
Professor Ruchi Ram Sahni, Lahore	25	0 0
Keshavlal M. Mehta, Esq., Ahmedabad	25	0 0
Rao Bahadur Raoji Bhai Patel, Baroda	25	0 0
The Hon'ble Babu Bhupendra Nath Basu, Calcutta	25	0 0
V. A. Desai, Esq., Ahmedabad	25	0 0
Nathabhau Lalubhai Vakilna, Esq., Surat	25	0 0
V. Ramesam, Esq., Madras	20	0 0
R. R. Kale, Esq., Satara	15	0 0
Rao Bahadur V. N. Pathak, Satara	12	0 0
T. D. Sanghvi, Esq., Bombay	10	0 0
Sir Gooroo Dass Banerjee, Kt., Calcutta	10	0 0
Dewan Bahadur K. Krishnaswami Rao, C.I.E., Madras	10	0 0
"A Benga Friend"	5	0 0
Dr. Joseph Benjamin, Ahmedabad	5	0 0
Dr. K. G. Deshpande, Satara	5	0 0
N. K. Agashe, Esq., Satara	5	0 0
V. G. Chirmule, Esq., Satara	4	0 0
D. N. Phadnis, Esq., Satara	2	0 0
D. G. Divekar, Esq., Satara	2	0 0
Y. R. Patwardhan, Esq., Satara	2	0 0
G. H. Devl, Esq., Satara	2	0 0
G. K. Devdhar, Esq., Poona	1	0 0
From Sales of the Report of the Calcutta Conference	20	0 0
Total Rs...	7,520	4 9

**Summary of Accounts of the Office of the Indian Industrial Conference
for the Eleven Months January to November 1908.**

Receipts.	Amount.		
	Rs.	A.	P.
Opening Balance	1,985	7	6
On ' Directory of Indian Goods and Industries ' Account.	1,286	10	0
From sales of Reports of the Second and the Third Indian Industrial Conference	93	13	0
<i>Donations :—</i>			
The Hon'ble Sir Vithaldas Damodher Thakersey, Kt., Bombay	250	0	0
Purushottam Vishram Mowjee, Esq., Bombay	250	0	0
The Hon'ble Mr. V. Krishnaswami Iyer, Madras	200	0	0
Dewan Bahadur Ambalal Sakarlal Desai & Sons, Ahmedabad	*200	0	0
Rao Bahadur R. N. Mudholkar, Amraoti	150	0	0
Dr. Harold H. Mann, Poona	100	0	0
P. R. Sundara Aiyar, Esq., Madras	100	0	0
Professor T. K. Gajjar, Bombay	100	0	0
R. N. Mookerjee, Esq., Calcutta	100	0	0
The Hon'ble Mr. Gokuldas K. Parekh, Bombay	100	0	0
Sir Bhalchandra Krishna, Kt., Bombay	100	0	0
R. Ramachandra Rao, Esq., Madras	100	0	0
The Hon'ble Munshi Madho Lal, Benares	100	0	0
Sir Currimbhai Ibrahim, Kt., Bombay	100	0	0
Messrs. Gordhandas and Mulraj Khatau, Bombay	100	0	0
Dwarkanadas Dharamsey, Esq., Bombay	100	0	0
Messrs. Karsondas Dharamsey & Co., Bombay	100	0	0
Bomanjee Dinsha Petit, Esq., Bombay	100	0	0
M. V. Joshi, Esq., Amraoti	100	0	0
Lalubhai Samaldas, Esq., Bombay	75	0	0
The Hon'ble Mr. B. N. Sarma, Vizagapatam	50	0	0
The Hon'ble Mr. P. S. Sivaswami Iyer, C.I.E., Madras	50	0	0
The Hon'ble Mr. Harkishen Lal, Lahore	50	0	0
N. Subbarao Pantulu, Esq., Rajahmundry	50	0	0
Narandas Purushottamdas, Esq., Bombay	50	0	0
Dr. Satish Chandra Banerjee, Allahabad	50	0	0
Dr. Tej Bahadur Sapru, Allahabad	50	0	0
The Hon'ble Pandit Madan Mohan Malaviya, Allahabad	50	0	0
Rao Bahadur Madhavaram Harnarayan Vyas, Cambay	50	0	0
' M. C.', Ahmedabad	50	0	0
The Hon'ble Mr. H. S. Dikshit, Bombay	50	0	0
Rustom K. R. Cama, Esq., Bombay	50	0	0
Sir Bepin Krishna Bose, Kt., Nagpur	50	0	0
Rao Bahadur Deorao Vinayak, Akola	50	0	0
G. A. Natesan, Esq., Madras	30	0	0

* Rs. 100 as the nucleus of a Permanent Fund.

Summary of Accounts of the office of the Indian Industrial Conference

Receipts.	Amount.		
	Rs.	A.	P.
C. Y. Chintamani, Esq., Amraoti ...	30	0	0
Manubhai Nanabhai, Esq., Bombay ...	30	0	0
Raoji Bhai Patel, Esq., Baroda ...	25	0	0
D. E. Wacha, Esq., Bombay ...	25	0	0
Rao Bahadur Khandubhai G. Desai, Surat ...	25	0	0
N. M. Bedarkar, Esq., Amraoti ...	25	0	0
Chunital M. Gandhi, Esq., Surat ...	25	0	0
Rao Bahadur Narayan Trimbak Vaidya, Bombay ...	25	0	0
T. A. Narasimhachariar, Esq., Krishnagiri ...	25	0	0
Rao Bahadur Waman M. Kolhatkar, Nagpur ...	25	0	0
Rao Bahadur Lalshankar Umiashankar, Ahmedabad ...	20	0	0
Rao Bahadur Dayabhai Harjeevandas, Baroda ...	20	0	0
V. Ramesam, Esq., Madras ...	20	0	0
Rai Iqbal Narain Gurtu, Benares ...	15	0	0
B. J. Shastri, Esq., Bombay ...	10	0	0
Bhulabhai B. Patel, Esq., Ahmedabad ...	10	0	0
Bezouji M. Jambusaria, Esq., Surat ...	10	0	0
Sankalchand J. Shah, Esq., Ahmedabad ...	10	0	0
Lala Dharamdas Suri, Lahore ...	10	0	0
Jaikishendas M. Vakilna, Esq., Surat ...	10	0	0
Babu Joogal Kishore, Benares ...	10	0	0
Ajodhia Das, Esq., Gorakhpore ...	10	0	0
W. V. Chandekar, Esq., Darayapur ...	10	0	0
D. G. Dalvi, Esq., Bombay ...	10	0	0
Babu Ganga Prasad Varma, Lucknow ...	10	0	0
R. A. Deshpande, Esq., Amraoti ...	10	0	0
Dewan Bahadur K. Krishnaswami Rao, C.I.E., Madras ...	5	0	0
B. D. Amin, Esq., Bombay ...	5	0	0
Total Receipts...	7,015	14	0

for the Eleven Months January to November 1908.

Disbursements.	Amount.		
	Rs.	A.	P.
Pay of the Assistant Secretary and other Establishment Charges ...	2,226	0	0
On ' Directory of Indian Goods and Industries ' Account.	707	12	6
On Reports of the Second and the Third Indian Industrial Conference Account ...	667	4	6
Travelling Expenses of the Assistant Secretary ...	430	8	3
On " Handloom Competition " Account ...	252	4	0
Printing (Miscellaneous) ...	120	15	0
Furniture ...	110	9	6
Postage ...	109	0	3
Stationery ...	70	3	6
Books ...	36	9	6
Newspapers ...	31	7	0
Railway freight ...	19	2	0
Sundries ...	8	5	9
Telegrams ...	3	13	0
Balance ...	4,793	14	9
Total ...	2,221	15	9
Total ...	7,015	14	6

R. N. MUDHOLKAR,

General Secretary,

Indian Industrial Conference.

AMRAOTI,

The 1st December 1908.

REPORT BY THE ASSISTANT SECRETARY ON HIS TOURS.

December 1907.

1. I left Amraoti on the 3rd December 1907 and stayed for the rest of the month—excepting a couple of days spent at *Bombay*—at *Surat* engaged in work in connection with the Conference which was held there on the 30th idem. I desire to acknowledge with thanks the earnest and helpful cooperation of the local Committee to whom in large measure the success of the session was due. The Parekh Technical Institute at *Surat*, the scope of which was lately extended owing to the munificence of the Bombay Government, is doing excellent work and growing in popularity. The Mahajan Home for Destitute Children is another useful industrial institution. *Surat* lace-work is famous.

January to November 1908.

2. By its Resolution VIII the Third Indian Industrial Conference reappointed me Assistant Secretary for the present year. Last year I appealed to the generous indulgence of the members of the Conference in judging my work, such as it was, as the breakdown of health compelled me to be absent on leave for four months. I was not under this necessity this year, and have been able to do more of touring, but it is with persistent ill-health that I have had to attend to duty during the larger part of the year and I trust accordingly that any serious shortcomings may be forgiven.

3. The first centre visited in the year was *Baroda*. In a brief interview which His Highness the Maharajah Gaekwar graciously accorded, he showed himself as interested in the industrial movement and the work of the Conference as ever he was and mentioned that an industrial survey of the State was in progress. The Kala-Bhavan, the well-known technical institute which has for years brought credit to the Baroda State, is being continually improved and expanded and students flock to it from almost every

province of India. The Baroda Bank, Ltd., was started during the year with several liberal concessions from His Highness.

4. From Baroda I proceeded to *Ahmedabad*, the largest centre of the cotton mill industry after Bombay. Hand-loom weaving too is carried on on an extensive scale, and there is lace work besides. Here is also the Gujarath Islam Match Manufacturing Company. The Gujarath Industrial Association is the local public body started to stimulate industrial activity. Under its auspices a public meeting was held with the venerable Rao Bahadur Lalshankar Umiashankar in the chair and I addressed it on 'The Swadeshi Movement and the Industrial Conference.'

5. I halted for a brief space of time at *Nadiad* on my return from Ahmedabad. Besides two mills, there are at Nadiad a hand-loom weaving company and a small hosiery works. The former was started in February 1907 with a nominal capital of Rs. 50,000, of which Rs. 15,000 was paid up. There are at work 22 looms which turn out checks, twills, carpets, *dhotis*, *khadis*, shirtings, towels and *saris*. Silk, mercerised and Leno cloth are also turned out. In the Company's factory are made warping, sizing, beaming and winding machines, with bobbins. These are made by ordinary carpenters under the supervision of the weaving master, who received his training in the Baroda Kala-Bhavan. Outside orders for looms and their accessories are executed at the factory.

6. I was at *Nagpur* on the 3rd February to attend a meeting of the Central Provinces and Berar Industrial Survey Committee of which I was nominated a member, and thence went to *Calcutta en route to Pubna* to assist in the organization of the First Bengal Industrial Conference. At Pubna the District Board maintains a Technical Institute.

7. From Pubna I was called to *Lucknow* for work in connection with the Second United Provinces Industrial Conference, which was held on the 1st March. Other places

that I visited in the United Provinces were *Aligarh*, *Allahabad* and *Benares*. At the first of these I addressed a public meeting on 'Indian Industries.' Aligarh is noted for its locks and other metal works. The Jubilee Workshop turns out a variety of finished articles in these descriptions and does in addition some nice leather work. At Aligarh also are made felt caps which are nearly as good as the fine imported article and are sold for nearly the same price if not less.

8. I went to *Bankipore* on the 10th April to take part in the First Behar Industrial Conference. The awakening to the need of industrial activity is as unmistakable in Behar as elsewhere, and it may be hoped that with the substantial help of the several wealthy zemindars and the whole-hearted cooperation of both the Hindu and Mahomedan communities, between whom the most cordial relations exist, the goodmen of this rich but comparatively backward and undeveloped tract may take their proper share in the great task of India's industrial upheaval. The Beharis are fortunate in having the Imperial Agricultural College and Research Institute as well as the Provincial Agricultural College located in their midst—the former at Pusa and the latter at Sabour (near Bhagalpore), while the *Sibpur* Engineering College is shortly to be removed to Ranchi, which is next door to Behar. At Bankipore itself there is a well equipped School of Engineering. Sugar, and several other industries (large and small), are native to Behar, and it will be at once their fault and their misfortune if the children of the soil do not make an effective effort to profit themselves by their plentiful natural resources.

9. From the 16th to the 19th September I attended the Industrial Conference at *Ootacamund*, called by the Government of Madras, who did me the honour of inviting me to serve on it. The Resolutions of the Conference and certain other papers relating to it, and the Government Order on it have been published, and it would be seen therefrom that a modest but promising beginning has been made in

the matter of giving effect to the recommendations of the Conference.

10. I visited several important towns in the Presidency, to wit, *Mangalore, Tellicherry, Calicut, Palghat, Coimbatore, Salem, Trichinopoly* and *Srirangam, Tanjore, Negapatam, Vellore, Vizagapatam, Vizianagram, and Ohicacole*. At several of these places industrial associations or committees had been brought into existence on the occasion of my last visit in 1906, and it is not a pleasurable reflection that not one of them has made a serious attempt at any time during these two years to foster industrial development. Nor have I been able to find in the districts men who would do regular and active work as secretaries. I have made no attempt to form an association or a committee at any place where there was no reasonable probability of its living and justifying its existence. It was one of the resolutions of the Ootacamund Conference that industrial committees should be formed in the districts. It remains to be seen what measure of success will attend the efforts of the Director of Industries (a special officer appointed on its own recommendation) in this direction.

11. Several industries and handicrafts are carried on at the places mentioned in the foregoing paragraph, more or less on a small scale. Besides the Mill and the Coffee Curing Works at Coimbatore and the large and almost perfectly organised Basel German Mission's Weaving Establishments and Tile Works at Calicut and Mangalore, there are the St. Joseph's Industrial Works, the Mangalore Weaving Company, the Depressed Classes Industrial Institute and the Aryan Soap and Candle Factory at Mangalore. At Palghat fine reed mat and bell-metal work is turned out. There are manure works and a considerable hand-weaving industry at Coimbatore. There is much industrial work carried on in the jail at this place. The Government Weaving Factory at Salem continues to do useful work under its able superintendent, Mr. N. Subramania Iyer. The Negapatam Steel Trunks Co. at Tanjore is turning out excellent

articles. At Tanjore there is a cooperative town bank, called the Nicholson Bank after Sir Frederick Nicholson. The South Indian Railway Workshops at Negapatam is a really grand concern a visit to which is in itself an education. The Gass Forest Museum at Coimbatore is a nicely arranged collection of forest products of considerable industrial value. There is a Government School of Commerce at Calicut. The Weaving Class in the Kalyanasundaram High School, Tanjore, has been closed for want of pupils.

At six of these places I addressed public meetings on the work of the Indian Industrial Conference.

12. I visited the Dussehra Industrial and Agricultural Exhibition and witnessed the Handloom Competition at Mysore in October. The Exhibition was well got up, more methodically arranged than any other exhibition that I have seen, and altogether, was an instructive show. An interesting feature of the Exhibition was the demonstration of the home training of women in industrial arts initiated by Dr. M. C. Nunjunda Rao of Madras. The Mysore Technical Institute affords instruction in several branches of industry, and has been making rapid progress under the very competent supervision of Mr. G. Subbusawmi Iyer, who had previously done good work as Head Master of the District Board Technical Institute at Madura. The Government of Mysore do much to promote technical education and manual training, which merits appreciative acknowledgment.

13. Before returning from the Mysore State I paid a running visit to *Bangalore*. Always famed as a pretty and healthy city, Bangalore will henceforth be known as the locality of the Indian Institute of Science, the buildings of which are in course of construction. Higher science teaching in the Mysore State will henceforward be centred in the Central College, Bangalore, literary subjects being taken up by the Maharajah's College at Mysore.

14. While at Madras I moved the Committee of the

National Fund and Industrial Association to take steps to arrange for the forthcoming sitting of the Indian Industrial Conference in that city and I am indebted to their courtesy for the meeting held on the 21st October at which a strong committee was appointed to do the necessary preliminary work.

15. After visiting the Exhibition at Nagpur I shall leave for Madras to place my services at the disposal of the local Committee in connection with the next Conference.

C. Y. CHINTAMANI,

AMRAOTI, }
The 1st December 1908. }

*Assistant Secretary,
Indian Industrial Conference.*

PART II.

A Brief Account of Industrial Activity in India in the Twelve Months December 1907 to November 1908.

SECTION A.

The Governments of British India and Indian States, and Industrial Development.

BRITISH INDIA.

India.—The State technical scholarships have been awarded this year as stated below :—Madras.—V. G. Nair, textile chemistry. The Central Provinces.—C. S. B. Naidu, textiles. Bengal.—M. N. S. Gupta, mining and R. T. Rout, leather tanning. Bombay.—G. R. Rele, bleaching, dyeing and printing. The Punjab.—Mahommed Amin, textiles, and Sheo Prasad, textiles. The United Provinces —Jwala Prasad, cloth dyeing and printing, and Muhammed Yusuf, dyeing. Eastern Bengal and Assam.—D. C. Nag, mining.

2. The Government of India have introduced a Patents Bill supplying the defects in the existing law, bringing it more into conformity with the Patents Act passed last year in England and altogether making it more suitable to existing trade conditions in India.

3. In view of the growth of manganese mining in India, a suggestion has been brought forward that the Government should render financial assistance towards the erection of smelters in central positions, to which the mines in the neighbourhood could send their ores to be treated. It is understood, however, that the authorities are not disposed to go so far as this, but are prepared to do all that lies in their power to assist private individuals or companies who desire to erect smelting plant, even laying down special lines of

railway where necessary to facilitate the transport of the machinery to the mines.

4. Work on the Indian Institute of Science was commenced this year and the construction of buildings is in progress. It appears that all the preliminaries have been satisfactorily settled between the sons of the late Mr. Tata and the Government of India. The building grants promised by the Government of India and the Mysore Government have been paid. The site chosen is at some distance from Bangalore City and covers 320 acres. Dr. Morris W. Travers, Director of the Institute and Professor of Chemistry, and Professor Norman S. Rudolph, Professor of Applied Chemistry, have arrived and are superintending the operations.

5. The Imperial Agricultural College and Research Institute at Pusa has also made satisfactory progress. The opening ceremony fixed for the 4th December has had to be postponed as His Excellency the Viceroy, who was to preside, had other pressing engagements.

6. A very informing Sketch of India's Mineral Resources has been published by the Geological Survey Department. Its author is the distinguished Sir Thomas Holland.

7. A memorandum on woods for packing cases, compiled for the Commercial Intelligence Department by Mr. R. S. Troup, Imperial Forest Economist, was published at the beginning of the year. Lists of woods used for tea boxes, cigar boxes, and other forms of packing cases are given therein. Detailed information on the woods in question, as regards quantity available and cost of supply, can be had from the Conservators of Forests in the provinces concerned.

8. The Imperial Forest Department is said to have in contemplation the publication of a report on the subject of Indian woods suitable for matches, sites where the establishment of match factories is likely to be profitable, and forests from which timber is available, detailed information on which has been collected.

9. It is to be regretted that the Secretary of State and

the Government of India have not yet seen their way to the publication of the Report of the Indian Stores Committee, which was submitted to them more than two years ago. The Government's orders on the recommendations of the Committee and the action they mean to take thereon, are not known to the public.

10. **Bombay.**—The Government of Bombay, who had been most unwilling to admit the necessity of an industrial survey, have this year taken an important step in the direction desired by the Conference by appointing Mr. P. N. Mehta, a recent holder of a Government of India scholarship for the study of the textile industry in England, to make an examination of the weaving industry of the Presidency. The lines on which a complete survey of industries is to be carried out are indicated in these words :—

‘ His Excellency the Governor in Council is further of the opinion that the examination of indigenous industries can only yield the desired results if entrusted in each case to an expert in the industry concerned. In accordance with this principle, the Industrial Survey of the Presidency must be the work of experts employed in succession, as funds are available, to examine and report on the position and requirements of each industry of importance.’

If only care is taken that this will not take an unduly long time, there can be no question that such expert investigation will be more fruitful than a layman's enquiries. Mr. Mehta himself has been appointed for a term of six months for the purpose of visiting the chief centres of the hand-weaving industry in the presidency. His instructions are :—

‘ He should prepare a comprehensive report, in which the present position of the industry and the practical measures that commend themselves to him for its assistance should be fully explained. In his report Mr. Mehta should deal specially with the following important points :—

- (i) Defects in the preliminary processes including reeling, warping, and sizing of yarns for the loom.
- (ii) Defects in the type of loom and appliances used for weaving.
- (iii) Defects in the system of procuring raw material, in securing the capital necessary to cover the cost of production of the finished cloth, and in placing it on the market.
- (iv) The possibility of introducing cooperation in the methods of working, or in financing the industry.

Mr. Mehta's attention should also be drawn to the new loom invented by the Salvation Army, to the experimental work in progress at the American Mission School at Amednagar, to the Japanese looms on trial in Belgaum City, and to the fly-shuttle attachment that is being successfully worked in the looms at Pandita Ramabai's Home at Kedgaon in the Poona District.'

11. The Government of Bombay have invited Professor Lees Smith of the London School of Economics and Political Science to deliver lectures in Bombay this cold weather on the subjects named below:—(a) commercial geography of the world in general and of India and the Indian seas in particular, (b) currency and banking, (c) control of labour, (d) exploitation of markets, (e) theory of railway rates and the connected branches of railway economics, (f) general theory of the application of power, and (g) commercial law and usages. The leading mercantile houses of Bombay have subscribed among themselves the Rs. 6,750 required to meet the cost of this series of lectures. It is the hope of the Bombay Government that the interest in higher commercial education which these lectures may rouse may lead to the early establishment of a thoroughly equipped College of Commerce in Bombay.

12. His Excellency Sir George Clarke's interest in matters connected with industry and education has been shown in another remarkable manner. Following his thoughtful and sympathetic Convocation address, his Government published a letter on Science Education in the Presidency suggesting (1) the concentration of higher science teaching at the College of Science, Poona, (2) the provision of laboratories for elementary science courses in Bombay, (3) the abolition of the science departments of the Elphinstone and Deccan Colleges, and (4) a compulsory course of elementary science for all candidates for degrees. The final orders of Government have not yet been promulgated, but it is certain that some striking developments will take place. His Excellency's enthusiasm for science education has proved contagious, and in response to his appeal for the cooperation of the merchant princes no

less than Rs. 18 lakhs has been placed at his disposal—Rs. 10 by Mr. Jacob Sassoon, Rs. 4 lakhs by Sir Cowasjee Jehangir, and Rs. 4 lakhs by Mr. Chinubhoy Madhavlal, grandson of the late Rao Bahadur Ranchodlal Chhotalal, C. I. E.

13. During the year the Government of Bombay have sanctioned certain proposals of Mr. Cecil L. Burns, Principal of the Sir J. J. School of Art, for reviving the art of Pottery and placing it on a scientific basis. Mr. Burns' view of this Department of the school is

'that it should be a small experimental Laboratory and Studio in which all the newest developments of the Art of Pottery should be tried, and through which they should be introduced into India; that only the best work in each kind of pottery and porcelains should be produced, and that complete records should be kept of each piece, so that the details down to the smallest item, including cost of production, shall be at the service of any manufacturer who decides to embark in the industry on a commercial scale.'

The carrying out of Mr. Burns' proposals entails a non-recurring expenditure of Rs. 7,227-8-0 to be incurred in 1908-9, and a charge of Rs. 806-14-0 for chemical apparatus to be purchased in the current year. This expenditure will be met from the Budget grant for Technical Education, and is not in addition to it.

14. A resolution of the Bombay Government has been published directing that any person desiring to erect a mechanical pumping installation on a river or stream might ordinarily be given the requisite permission without any charge being made for the water for a period of 25 years. *Tagai* will be granted to persons desirous of erecting such installations anywhere in accordance with the ordinary rules, each case being decided on its merits.

15. **Madras.**—The Government of Madras held an Industrial Conference at Ootacamund in September 'in order to consider whether, and if so how, the industrial development of the Presidency could be further promoted.' The Conference, which was of a thoroughly representative character, was opened by His Excellency the Governor with an inaugural address, which has been published. It met

for six days and its sixty-seven resolutions bear witness to the exhaustive character of its survey of the industrial field. The Government Order on the recommendations of the Conference has been published too. A Director of Industries has been appointed, and to him is entrusted the control of industrial instruction (not technical education). Other resolutions of the Conference that have been accepted by the Government are the formation of a bureau of industrial information and an industrial museum, the preparation of a list of industries which are of sufficient importance to require the establishment of industrial schools in relation to them, and the formation of local industrial committees. The Director of Industries has been asked to submit proposals for the establishment of weaving schools, the employment of a dyeing expert, the development of the Sembiam tannery into a leather trade school, the offer of a reward for a suitable oil extracting plant, the extension of the well-boring operations, and the constitution of a board to which the consideration of the condition of the chemical industries of the Presidency may be committed.

16. The Government of Madras made a liberal contribution of Rs. 2,500 towards the expenses of the All India Weaving Competition organised by the National Fund and Industrial Association in February last, and otherwise evinced great interest in its success. Mr. Alfred Chatterton, Director of Technical and Industrial Inquiries under the Government, took an active part in its organization. He as well as several other officers of Government—among them Mr. R. Ramachandra Rao, Registrar of Cooperative Credit Societies, made helpful contributions in the discussions that took place at the Handloom Conference. And His Excellency the Governor gave away the prizes to the successful competitors.

17. The Agricultural College at Coimbatore, upon which a considerable amount has been expended, is approaching completion. Classes were, however, opened in June last, and instruction is imparted on the lines laid down

by the Principal, Mr. C. W. J. Shepperson, and approved by the Government.

18. The Madras Government have approved generally of the lines on which Sir Frederick Nicholson proposes to proceed in the experimental development of marine fisheries in the Madras Presidency. The proposal to locate the first experimental fishery station at Ennore, on the east coast, instead of at Tellicherry on the west coast, is accepted, and sanction is accorded for the expenditure of Rs. 33,500 in the purchase and erection of the required plant and towards the cost of the station during the current year.

19. The Madras Government have made a grant of Rs. 5,000 to the District Board of Tinnevely towards the cost of purchasing a building for the local Technical Institute. Directions have been issued that such modifications as may be necessary should be made in the curriculum in order to secure that the instruction is given on proper technical lines and that a suitable educational test is prescribed as a condition of admission.

20. The Government of Madras are continuing their scheme to popularise cotton cultivation in Kurnool by granting premia to ryots for growing 'practically pure' cotton. The Agricultural Department had advised against such continuance, but the Government have taken a different view.

21. Bengal.—Early in the year the Government of Bengal placed Mr. J. G. Cumming, I. C. S., on special duty to make an investigation into the state of industries and technical education in the province. After about six months of enquiry Mr. Cumming produced two reports on the two subjects which are informing and instructive. The orders of Government on Mr. Cumming's recommendations in either matter have not been issued as yet.

22. At a meeting of the Bengal Legislative Council held on the 7th of April, the Honourable Mr. H. C. Streatfield, Financial Secretary to the Government, said among other things that the proposals of the Bengal Government 'for the appointment of a Special Technical Adviser to

Government and for the opening of classes in Technological Chemistry have both been sent back by the higher authorities—the first, because the class of men we want is almost impossible to find ; the second, because of doubts whether there is any real demand for the services of such students as the classes would turn out.' 'The Weaving School at Serampore also remains unopened ; the Principal appointed in England having, at the last moment thrown up the appointment.' Mr. Streatfield furnished details of the six lakhs provided in the Budget for Technical Education, which are as follows :—

					Rs.
Sibpur College	...	...	...	...	3,27,700
Equipment for Sibpur College		...	...	...	40,600
B and C classes in High Schools		...	...	...	10,000
Calcutta School of Art	...	...	...	...	34,000
Government Art Gallery	...	...	...	...	9,000
Engineering and Survey Schools		...	...	...	43,000
Industrial Schools...	...	...	...	...	12,000
Scholarships in Professional Colleges	...		...	...	50,480
Do. in the School of Art	...		...	...	900
Do. in Engineering and Survey Schools	...		...	...	4,632
Total Rs....					5,32,312

Adding Rs. 35,000 for the Serampore Weaving School, said Mr. Streatfield, the total comes to Rs. 5,65,312, or 6 lakhs in round numbers.

23. New scholarships, the joint gift of the Government of Bengal and the Mining Association of Bengal, are to be given to special students in the Mining Department of the Sibpur College. These will enable intending mining engineers to go through the College two years' mining course at no expense to themselves. The Sibpur College Mining Diploma is recognised by the Government and its holders are exempted from two of the five years' practical experience demanded from candidates for first class manager's certificates. The scholarships will be awarded to candidates who have completed at least two years' practical work upon a mine and have passed the Entrance examination or a test recognised as equivalent to it. No limit of age is fixed. The scholarships are four in number, two of Rs. 150 month-

ly, for Europeans, and two of Rs. 50 monthly, for Indians, each tenable for two years. They will be awarded annually by the Director of Public Instruction on the recommendation of the Mining Advisory Board. With a view to encourage the teaching of Sericulture at the Sabang Seri-Agricultural School in the district of Midnapur, the Government of Bengal have sanctioned the creation of four scholarships of Rs. 5 each tenable for one year.

24. Investigation into the fisheries of Bengal, which was begun by Mr. K. G. Gupta, is being continued by Mr. A. Ahmed. A Fishery Board, which is thoroughly representative, has been constituted by the Government to advise them on the steps that should be taken from time to time. A lakh of rupees has been allotted for the purpose in the current year's budget, and a steam trawler is working.

25. The Bengal Provincial Agricultural College at Sabour was opened in July by the late Lieutenant-Governor, Sir Andrew Fraser, and an excellent address on agricultural development was delivered on the occasion by Mr. Gourlay, the Director of Agriculture.

26. **The United Provinces.**—Of the educational activity of the United Provinces Government in the branches with which this report is concerned the two passages reproduced below from His Honour the Lieutenant-Governor's University Convocation address will give a clear idea :—

' In order to carry out this scheme for a school-leaving certificate, it has been determined to introduce a sound system of manual training into secondary schools, to improve the teaching in science, both theoretical and practical, to add botany and agriculture as alternative subjects and to start teaching in commercial subjects in selected institutions.'

' It (the Government) has also been active in directing its attention towards encouraging different forms of practical education. It has established experimental weaving schools at three centres and proposes to have a central weaving school at Benares. It is building one new industrial school as well as enlarging the one at Lucknow, and contemplates building a third one : the building of a school of design at Lucknow and of a school of carpentry at Bareilly has actually been taken in hand. Later on it hopes to establish a school for tanning leather by the

chrome process, and it may be possible to start a school for the necessary cultivation of the humble art of cookery. It has submitted for the sanction of higher authority a proposal for the establishment of a technological institute to undertake industrial research, and to train the educated classes to be managers, overseers, foremen, and investigators. An agricultural college is under construction, and will, it is hoped, be opened next year.'

Sir John Hewett said later in a speech at Cawnpore, that the initial cost of the 'modest' but 'very practical scheme for the development of industrial education in this province' which was devised by last year's Naini Tal Conference, was $15\frac{1}{2}$ lakhs and the recurring cost $4\frac{1}{2}$ lakhs. His Honour added:

'I have just been informed that our scheme has been recommended to his Majesty's Secretary of State for India, and I trust that in due course it will receive his sanction. It provides for an industrial school and a technological institute at Cawnpore, the latter institution to undertake industrial research and to train the educated class to be managers, overseers, foremen and investigators. These and the other details of our scheme cannot fail, I believe, to be of immense benefit to the Province generally, and to Cawnpore in particular.

27. An account of the steps taken by the U. P. Government for the revival of the hand weaving industry cannot fail to be interesting. They decided immediately after the Naini Tal Conference to start three demonstration stations or schools at Tanda, Moradabad and Saharanpur, all weaving centres, to popularise the fly-shuttle loom and the simpler improved warping and other preliminary processes. They sent Mr. A. C. Chatterjee—the officer on special duty who lately completed the industrial survey—to Jabalpur, Ahmednagar, Serampore and several places in the Madras Presidency to familiarise himself with the methods in vogue there. The Lieutenant-Governor decided after some consideration to try the Serampore fly-shuttle loom and slay at Tanda, the Salvation Army patterns at Saharanpur and both kinds at Moradabad. These schools were organised early in the year. They are managed by local committees under the guidance of the District Officers. The Government have allotted adequate funds. At Tanda, two

skilled Bengali weavers have been imported on good wages and the services of Mr. P. N. De were engaged temporarily to organise the school in the first instance. For Saharanpur and Moradabad, weavers trained at the Hewett Weaving School, Bara-Banki, are employed. Babu Kulwant Rai, Deputy Inspector of schools, who managed the Bara-Banki School, from its inception, was placed on deputation under Mr. Chatterjee to organise and supervise these schools. Much interest has been taken in them by the local *julahas* (weavers).

28. His Honour the Lieutenant-Governor directed that the 'Hadi' processes of Sugar-making should be worked on a commercial scale in 1907-08 as widely as possible, and particularly in the important cane tracts of Meerut and Rohilkhand divisions. To quote from the Government Resolution :

'Arrangements were made to secure sufficient supplies of cane and to secure the cooperation of landholders and sugar manufacturers in convenient centres, the intention being to have at least one factory at work in each area where the production of sugar is important. These arrangements were, however, entirely disorganised by the drought of September 1907 ; the cane rapidly fell off in condition, and disease became very prevalent ; landholders and manufacturers found themselves unable to supply the cane which they had promised ; cultivators, tempted by the high price of *gur*, broke their contract to deliver juice ; the uncertainty of the economic position deterred the manufacturers from undertaking new enterprises ; and despite the hearty cooperation of district officers, particularly the Collectors of Bareilly and Moradabad, it was found impossible to organise any important demonstrations in Rohilkhand, while the plans for the Meerut Division had to be revised at the last moment, and eventually were carried out only through the cordial assistance of the Collector of Meerut. Eventually four factories were worked in the province while assistance was also given to manufacturers in other parts of India.'

Particulars of the working of these factories are stated in detail in a Note by Khan Bahadur S. M. Hadi, which will be given free by the Department of Agriculture, U. P., to all inquirers. And those who desire information as to the financial results of the factory-working are recommended to apply for it.

The most important of the factories worked by Mr. Hadi

was established at Panchili. It consisted of five divisions as follows :—(1) The sugar school, (2) the trial of new sugar machinery, (3) experiments in determining certain points of economy in the process and in comparing the indigenous methods of manufacture with the new ones, (4) further improvements in the new process, (5) the working of a demonstration factory on commercial lines and the providing of assistance to other factories. The number of students was 80, and these came from the United Provinces, the Punjab, Madras, Bombay, the Central Provinces, Gwalior, Kathiawar and Burma. It is impossible to go at this place into financial details : it suffices to say that a clear margin of profit was shown on the working of the factory, all the disadvantages under which it worked notwithstanding. The factory served useful purposes otherwise :

‘ It has imparted practical training, it has taught us numerous useful lessons, it has supplied managers, mechanics, and boilers to distant sister factories, it has given an amount of publicity to the process which could not have been possible otherwise, and it has induced others to imitate. It was the factory at Panchili that induced Daulatpur and Amroha to start concerns this year, which would not have been the case if the intending proprietors had not seen for themselves the operations at Panchili.’

The Lieutenant-Governor says in conclusion of his observations :

‘ In spite of the defective quality of the raw material all the factories in this province worked at a profit, the percentage of which varied from 14 to 67 when calculated in the way usually followed in the industry. The results are distinctly satisfactory considering the character of the season and the drawbacks incidental to the working of factories of a novel type and the Lieutenant-Governor considers that the methods of manufacture which have been developed by the Assistant Director may now be recommended to the public as well adapted to the conditions of the greater portion of the province.’

29. Before leaving the subject of sugar we must refer to the reduction of the sugar-cane rate in the districts of Saharanpur, Meerut and Muzaffarnagar from Rs. 10 an acre to Rs. 6-10-8. The enhancement of the rates was made in 1906, so that it had not been in force very long.

‘ My opinion has always been ’ said Sir John Hewett in his Legislative Council on the 7th April, ‘ that it is very unwise to enhance the canal rate

on a product like sugar in which the indigenous article has to be produced in the face of violent competition from outside the country, and I am exceedingly glad that the Government of India have agreed to reduce the rate. I may add that the reduction is not, as some people seem to think, a temporary one due to the famine, but that it is intended to be permanent.

30. The commercial possibilities of a cotton seed oil industry in the province was one of the subjects that were before last year's Conference at Naini Tal. The Government have decided to carry out certain experiments in this direction at Cawnpore in cooperation with the Upper India Chamber of Commerce. They have contributed a sum of Rs. 10,000 for the importation by the Chamber of the necessary plant and machinery for the trials.

31. The United Provinces Forest Department sent specimens of two kinds of wood to the Kota match factory and both have been found suitable for matches and match boxes. The question of wood pulp for paper-making has been taken up, and an ample supply of wood suitable for the purpose is believed to exist ; further, various woods, such as *shisham*, *tun* and *jaman khari* and *semal* are regarded as possible material for the manufacture of pulp packing cases and other uses. In connection with the supply of limestone from forest areas, the question of reducing the royalty (in the Eastern Circle Rs. 10-8-0 per 100 maunds of stone, and in Dehra Dun Rs. 12 8-0) is under consideration by the Government.

32. On the occasion of the visit of His Honour the Lieutenant-Governor to Bareilly early* in November, an Agricultural Demonstration and Exhibition was held by the local Agricultural Association. The programme included a sugar demonstration by Khan Bahadur S. M. Hadi, Assistant Director of Agriculture, a demonstration of handlooms under the superintendence of the Deputy Inspector in charge of the Moradabad Weaving School, and a demonstration of maize hullers by the Agricultural Department under the superintendence of Dr. Parr, Deputy Director of Agriculture.

33. The Punjab.—A Weaving School, called after the Lieutenant-Governor the Dane Weaving School, has been opened at Ludhiana with a number of the Salvation Army Works improved looms which it is desired to introduce among the weavers of the province. Sir Louis Dane presiding at the opening ceremony, made an important speech setting forth his opinions on questions of industrial development. When His Honour said that 'a complete industrial survey has been made of all the principal industries of the province,' he was evidently thinking of the monographs on different industrial arts which have been published in the Punjab as in other provinces. These monographs, however, cannot take the place of a thorough and detailed industrial survey. While, therefore, Sir Louis Dane's proposal 'to revise these monographs and republish them' is excellent, it may be hoped that His Honour may consider the desirability of having a real industrial survey made of the province. Sir Louis Dane announced in the same speech that steps were being taken 'to raise and develop the School of Engineering at Lahore so that our province may be more self-supporting in the matter of mechanics, overlookers and engineers.'

34. There was a demonstration of Mr. Hadi's sugar-making process. The Government remark on it as follows in their review of the Report of the Director of Agriculture :—

'It was somewhat unfortunate that a demonstration was undertaken before the suitability of the plant to the conditions of the Punjab had been definitely ascertained. The past season was exceptionally unfavourable to sugar-making, and this was partly the explanation of the failure. Further experiments will be made in a tract more suitable for the working of the plant.'

35. Eastern Bengal and Assam.—The Government of Eastern Bengal and Assam placed Mr. J. N. Gupta, I. C. S., on special duty to conduct an industrial survey of the province. He was expected to complete the enquiry by the month of October, after which, according to Sir Charles Bayley, the late Acting Lieutenant-Governor, the report was

to be referred to a committee to submit recommendations to the Government on the action they should take upon it.

36. The Government decided that this province, while working in concert with Bengal in measures for the revival of the silk industry, should have a separate staff for the purpose. The Department of Agriculture, Eastern Bengal and Assam, has therefore taken over from the Bengal Silk Committee the charge of all sericultural operations in the districts of Eastern Bengal, including the two small pure-seed stations in Rajshahi. These are to be supplemented by two large rearing stations, one in Rajshahi and the other in Bogra, each controlled by a responsible officer of the grade of Sericultural Superintendent. One such officer after passing through a course of sericulture in Tokio University is now receiving special training in Indian methods. The Sericultural School at Rajshahi will be continued on the lines established last year. Twelve apprentices are received who must be sons of silk-rearers.

37. **The Central Provinces and Berar.**—Mr. C. E. Low, I. C. S., the officer placed on special duty to carry out an industrial survey of the provinces and to organize the Exhibition, completed his preliminary enquiries and published notes of the same early in the year. A set of questions was framed by him in the shape of answers to which the requisite information should be obtained by local committees formed in the districts, and these received the approval of the Industrial Survey Committee which was formed to act as an advisory body. Not much progress would seem to have been made with the enquiries as Mr. Low's whole time was engaged in getting up the Exhibition. Very lately, however, an officer of the Provincial Executive Service—Mr. D. V. Saranjame, has been placed on special duty for six months to visit different industrial centres in Berar and collect the needed information. The investigation, it should be stated, is limited to cottage industries. It is believed that a similar

appointment will shortly be made for work in the Central Provinces.

38. The Central Provinces and Berar Exhibition, for which grand preparations had been made, was opened by the Hon'ble the Chief Commissioner on the 12th November. It is the result of the conjoint labours of the Government and the people. The brunt of the work has fallen on Mr. Low, but the non-official secretaries—Rao Bahadur V. R. Pandit and Mr. Krishna Rao Phatak—and the members of the Committee laboured devotedly, too, for its success. The Agricultural and Forest Departments deserve credit for their exceedingly well organised sections. The Exhibition has cost a great deal as was to be expected, and the large amount that was needed was contributed by the Government, local bodies, and the general public. There are six sections of the Exhibition, *viz.*, agricultural, textile, mining, wood and metal work, forest and miscellaneous, and the collection of exhibits in every section is rich. It is illustrative of the progress made by the provinces since the last Exhibition was held at Nagpur in 1865 when Sir Richard Temple was Chief Commissioner, and as such, well worth a study. Even those who may not think much of the practical value of such exhibitions as aids to industrial development will admit that this present Exhibition does not fall in the category of shows of doubtful utility as it is held after an interval of 43 years after the last Exhibition at the same place. A Weaving Competition has been organised in connection with the Exhibition and looms from all parts of the country have been entered for the competition. And it may be affirmed with confidence that the Government and the philanthropic individuals who found the funds, as well as the official and non-official gentlemen who laboured strenuously at its organisation, have done public service of no mean value.

INDIAN STATES.

39. The Nizam's Dominions.—The Government of His Highness the Nizam have appointed Mr. H. T. Harr

to the Education Department for technical and industrial education and to the Jail Department for the improvement and development of jail manufactures and industries. Those who are acquainted with Mr. Harris's critical and descriptive report of the last Madras Congress Exhibition and of his informed enthusiasm for industrial work will hope that his tenure of this office may be marked by important steps in advance.

40. **Mysore.**—A few passages of the Dewan's address to the Representative Assembly contain particulars of what has been done by the Government of the State in matters bearing on industrial development.

'Government have devoted attention to measures for the improvement of the silk industry, but owing to various reasons it has not been found practicable to devise a suitable scheme. The question of utilizing Mr. Tata's Farm for giving sericultural instruction to those engaged in silk worm rearing, is under the consideration of Government, and in the meanwhile Government have arranged for Mr. Odzu, the Superintendent of Mr. Tata's Farm, visiting centres of silk industry under instructions from the Revenue Commissioner and giving advice on the selection of seed and the rearing of worms.'

'The abundance of a very high-class iron ore has long been a tradition in Mysore and representations have from time to time been made in the Assembly that Government should take the industry in hand and start iron works on a large scale. Investigations are being carried out in the Geological Department in regard to the supplies of iron ore available, but it will be some time before it will be possible to furnish any trustworthy results. In many cases the results so far obtained have been disappointing though it is expected that some large and valuable deposits will yet be disclosed. During the year Dr. Smeeth was deputed to Turin to witness some trials proposed to be made by an Italian scientist in the smelting of iron ores with the electric furnace, but owing to a breakdown in the arrangements the proposed trials could not be made. Dr. Smeeth was however enabled to make some experiments in the smelting of iron ore and in the production of steel and his report is under preparation. It is understood that Dr. Smeeth's conclusions point to the feasibility of the development of an iron and steel industry in Mysore in the future. For the present, however, the production of pig iron and the cheaper forms of structural steel cannot be recommended, and work will have to be confined to the production of the higher priced classes of steel and ferro-alloys on a moderate scale.'

'It is proposed to concentrate science teaching in the Central

College, Bangalore, and to confine the teaching in the Maharajah's College, Mysore, to the literary subjects.'

'The services of Dr. Gustaf Larsson, Principal of the Sloyd Training School, Boston, U.S.A., and of Miss Latter, a distinguished kindergarten specialist who had long been connected with the London School Board, were secured for a period of some months to organise the teaching in these subjects and to train teachers. Dr. Larsson was engaged on this duty from September 1907 to April 1908, and 22 teachers of High Schools were trained in the system. Dr. Larsson formed a very favourable opinion of the men deputed to undergo the training and found them to be most apt and willing pupils. He has left it on record that they made progress far beyond his expectations based on experience of similar teachers in America.'

'As regards the future development of these courses of training, arrangements have already been made to open nine Sloyd centres in connection with the Government High Schools, in which boys of these schools as well as boys of other schools in the neighbourhood, of Forms II to IV will be trained. Cardboard work will be introduced into the first three Anglo-Vernacular classes below Form II in a large number of Anglo-Vernacular Schools and Kindergarten hand-work in the lowest classes.

'Technical and Industrial Education has been making substantial progress, and the various schools, especially the school in Mysore, did excellent work. Sanction has been accorded for opening a new school in Sagar. The work of acquiring land for the Chamarajendra Technical Institute was proceeded with last year and the erection of the necessary buildings will be taken up this year.

The rules for the Damodar Dass Scholarships were revised so as to secure persons of high education and intelligence as candidates for the scholarships as it was found that the former rules did not ensure this result.'

41. The four weavers sent to the All India Weaving Competition at Madras from the Industrial School at Molkalamuru, at the expense of the Mysore Government, created among the local weaving community a desire to use improved looms by their appreciative accounts of the working of these at the Competition. As a result, the Mysore Government issued orders reconstituting the School so as to make it a real source of instruction in all different kinds of weaving practised in the locality, by equipping the School with looms suited to each particular handicraft, and not merely to introduce the use of the fly-shuttle looms.

which are represented to be quite unsuited to the weaving of silk cloths.

The Hole-Narsipur Weaving Institute is doing excellent work too. The manufacture of a variety of fine cotton and silk cloths is in progress at the Institute, where also in imitation of Japanese grass works, the mat industry is being developed. Some trials in experimenting aloe and plantain fibre and weaving it into cloths for domestic use have also been made ; while the processes of dyeng yarn, silk and wool with vegetable dye stuffs, which have been almost abandoned by weavers in favour of artificial dyes are being experimented upon in the Institute.

42. The Mysore Government have awarded four scholarships of £ 200 each per annum for studying any of the subjects named below in some British or other recognised University or Technical institution approved by Government: (1) Mining and Metallurgy, including Electro-Metallurgy ; (2) Advanced Chemistry ; (3) Advanced Physics ; (4) Electrical Engineering ; (5) Application of Physics or Chemistry to Agriculture and to the various arts and industries. These scholarships are open to Indians outside the Mysore State as well, though, other qualifications being equal, preference will be given to a Mysorean.

43. The annual Dussehra Agricultural and Industrial Exhibition was held at Mysore in September-October. It was opened by His Highness the Maharajah and the prizes for the best exhibits were also given away by him. As in the case of other exhibitions, the Agricultural section was the richest, textiles coming alter it. There was a Weaving Competition at the Exhibition.

44. **Baroda.**—His Highness the Maharajah Gaekwar ordered an economic and industrial survey of the State to be made under the superintendence of Mr. Whitenack, Economic Adviser to the State. The questions drawn up by him are the most exhaustive of their kind, comprising as they do, population, land, agriculture, manufactures and industries, trade, technical and manual training, transport facilities, taxation

in relation to economic development, and banking. When the report of the inquiry is published it ought to be a perfect storehouse of facts about the economic situation in Baroda.

45. The Bank of Baroda, Ltd., has been started under the patronage of and largely supported by His Highness the Gaekwar. The capital of the Bank is Rs. 20 lakhs. The concessions granted to it by the Maharajah are the following :—

(1) The Baroda Government will deposit with the Bank without interest an amount equal to one-fourth ($\frac{1}{4}$) of the paid-up capital, not exceeding two and a half ($2\frac{1}{2}$) lakhs of Rupees.

(2) The Baroda Government will maintain deposits with the Bank equal in amount to three fourths ($\frac{3}{4}$) of the paid-up capital, but not to exceed seven and a half ($7\frac{1}{2}$) lakhs of Rupees in any case. at the rate of four (4) per cent. per annum, if and when considered necessary by the Directors, provided that the Bank maintains at all times within the State assets equal to the amount so deposited.

(3) Concessions (1) and (2) above shall hold good for a period of fifteen (15) years.

(4) The Baroda Government will pay to the Bank annually one-half ($\frac{1}{2}$) of the salaries and expenses of management for a period of five (5) years on condition that the Bank engages an expert manager, and with the further proviso that the sum so paid shall not exceed Rs. 10,000 per annum.

(5) The State will turn over to the Bank from time to time such proportion of the State's banking business, *i.e.*, the receipt, remittance, collection and payment of money or securities and other matters usually transacted by Bankers for their customers, as the prosperity and condition of the Bank may warrant, and as may be agreed to between the Government and the Directors.

(6) The Government will appoint auditors to audit the books including the ascertainment of assets under clause 2 above and accounts pertaining to its own business with the Bank, such audit to be at the expense of Government ; it shall interpose no other supervision or interference with the Bank's affairs.

These concessions will amount to 4 per cent per annum on the full amount of ten lakhs of Rupees that it is intended to call up.

In addition to the above generous concessions of the Baroda Government, H. H. The Gaekwar has personally subscribed a large block of shares.

The Bank was formally opened on the 9th July by His Highness in person, and he delivered on the occasion one

of his illuminating addresses on the paramount need of industrial development for the prosperity of the people.

46. Arrangements are being made for erecting a cotton seed oil factory in the State. An expert in tanning, who received his training in America, has been employed to develop the chrome-tanning industry. He visited tanning factories at Bombay, Madras and Cawnpore, and has since been engaged in starting a chrome-leather factory at Baroda. Concessions in the matter of Customs and water-rate were granted to a flour mill started in the preceding year. And the Government have ordered suitable roads and arrangements for adequate water-supply to be made for the new mills near the Baroda railway station. The subjects of fibres, cotton cultivation, dairying, flour mills, starch and sugar-making, chocolate, glass, cement, brick and tiles, tobacco growing and curing, have been engaging the attention of the Economic Adviser.

47. Gwalior.—The Government of this State have secured the services of Rao Bahadur Syam Sundar Lal, C.I.E., late Dewan of Kishengarh State and a member of the MacDonnell Famine Commission, as Minister of Agriculture, Industries and Commerce. Under his able guidance several industries are being carried on. Factories for the manufacture of glass, boots and shoes, sodas and several other articles of daily use are subsidised by the State. The Scindia Leather Factory prepares saddlery and harness, portmanteaus and trunks, belting for machinery, etc. The Merar Tannery does the tanning for the Leather Factory. The Scindia Metal Works prepares padlocks, letter-locks, steel trunks and kit-boxes. The Scindia Paper Mills manufactures various kinds of writing, packing, coloured and blotting paper, and card board. The State has undertaken quarrying as well and all sorts of building materials are made from the well-known Gwalior sand-stone. There is a carpet factory which manufactures woollen carpets of beautiful designs and excellent finish. Silk and Cotton *sarees*, and Chanderi Muslins renowned for their fineness of texture,

are made in the Gwalior Saree Weaving Factory. The Central India Outfitting and Tailoring Co., Ltd., receives State aid and has up-to-date machinery worked by power.

48. To the Gwalior Cotton Mill, Ltd., which was registered as an English Company with sterling capital and a London directorate, several exceedingly liberal concessions have been made by the State. These are :—

‘ A concession for 99 years renewable for a further like period. Seventy thousand square yards of land leased for 99 years at a rent of £3-6-8 per annum and free supply of water from the Sagar Tal Tanks. No other mill to be allowed within the State for 15 years. Customs duties not to be levied excepting the 3½ per cent. excise by the British Indian Government and 2 per cent. income tax payable to the Gwalior State on the nett earnings not exceeding 4 per cent. No duty on the yarn which will represent 80 per cent. of the output of the mill. Yarns imported into the State to be taxed at 1½ per cent. and all cloths at 6½ per cent. Coal, oils and other stores for the mills to be duty free. The Company to be given a loan of Rs. 5 lakhs at 4 per cent. interest from H. H. the Maharajah to be paid off fully in 1916 on the security of goods of 10 per cent. more value to be kept in the bonded warehouse.

In return for these concessions Rs. 3 lakhs out of the total capital of £ 250,000 (Rs. 37,50,000) have been reserved by the Company to be taken up by the people of Gwalior themselves.

49. The Government maintain a Technical Institute and Workshop where instruction is imparted in carriage building, cabinet making, iron safe making, watch making and repairing, and pottery. Moulding, carpentry, blacksmithy, and copper and silver smithy are taught in the Workshop.

50. **Junagadh.**—A new cotton mill, named the Rasool-Khanji Mill, has been erected at Junagadh, and several concessions have been made to it by His Highness the Shahzada. To start with, there will be 20,000 spindles and 400 looms. The main object of the mill will be the manufacture of coarse yarns and cloths to meet the immediate needs of the surrounding population. Its other object is to create a demand for textile fabrics in the Persian Gulf and on the Hadramont littoral in competition with Russian merchants.

In his speech on the occasion of laying the foundation stone of the mill, which he did, His Highness the Shahzada spoke of the efforts of his Department of Agriculture to introduce fresh and improved varieties of cotton into the State, which he said bade fair to succeed.

51. **Mourbhanj.**—The manufacture of tussar silk cloth is an important industry of the Mourbhanj State, giving subsistence in its decadent state to 8,000 persons. To revive the industry advances for the purchase of tussar cocoons were made by the State during the year. The bleaching and dyeing of tussar fabrics at the cost of the State was also sanctioned, and was partially successful.

52. **Chota Udepur.**—The introduction of the Salvation Army 'Triumph' automatic handloom will, it is thought, afford work to the people of a profitable nature, and the loom is to be gradually introduced into villages by the Durbar, who by means of monetary advances, hope to induce the villagers to give this loom their best attention.

53. **Cochin.**—In Cochin a uniform system of weights and measures has been adopted throughout the State. The people welcome this measure as a boon as they appear to have been regularly cheated by reason of the use of false weights and measures.

Educational reform is in the air in Cochin. The Dewan, Mr. A. R. Banerjee, I.C.S., has promulgated a scheme of reform which will not, however, be introduced till after further consideration.

PART II.

SECTION B.

Industrial Activity of the People.

BOMBAY.

1. An account of industrial activity in the Bombay Presidency may fittingly open with a citation of the following passage from the Bombay Administration Report for 1906-07 which was published in the early part of this year :—

‘ The year is one of promise in that its industrial record seems to show that the Bombay merchant is growing alive to the fact that there are other industries than cotton worthy of exploitation. It is true that the building of cotton mills, weaving and spinning sheds, ginning factories and godowns proceeded no less actively than in former years, but the new sugar, fibre, soap and other factories which made their appearance, though, of course, only in the experimental stage at present, afford reasonable ground for expectation that, aided by the *Swadeshi* movement, their number will increase and induce other pioneers to break into paths of industry hitherto untrodden. One of such industries lately opened up is that of manganese mining, which already employs 6,400 men in the Panch Mahals and promises to considerably modify conditions in that somewhat arid district. There are said to be hopes in the same direction for Ratnagiri, licenses for exploration having been applied for during the year while similar applications have been received in Dharwar, Belgaum and Bijapur. The gold mines of the former district were hardly so prosperous as was expected. Simultaneously with the opening out of new industries come attempts to save the old from extinction and the prophecy of failure made in the Bombay Report for last year seems likely, we are told, to be falsified, at any rate in Ratnagiri where the hand-weaving industry seems to have received an impetus from the introduction of an improved loom. ’

2. Several new spinning and weaving mills have been started during the year at Bombay and Ahmedabad as well as a few other places in the Presidency. Besides, weaving sheds have been added to several mills which had done spinning alone. The new mills started at Ahmedabad are the Himabhai Manufacturing Co., the James Weaving Mill, the Shri Ramakrishna Mill, the National Mills (spinning alone),

the Ahmedabad New Edward Manufacturing Co., the Raipur Manufacturing Co., and the Gordhan Spinning and Manufacturing Co. The New Edward Mill already does both spinning and weaving, and the Raipur and Gordhan Mills do spinning only for the present. Two more mills called the New Manockchowk Spinning and Weaving Co. and the Ahmedabad New Cotton Mills Co. have also commenced weaving. The Ahmedabad Spinning and Manufacturing Mill does likewise.

The directors of the Standard Mill, Bombay, mean to instal at their mill bleaching, dyeing and printing plant at a cost of about Rs. 1,27,500. This new addition will be a distinct department by itself. The Standard Mill consists of 43,152 spindles and 1,172 looms independently of this latest addition. The Spring Mills was started at Dadar, Bombay, in connection with the Bombay Dyeing and Manufacturing Co., Ltd. This step was taken owing to the difficulty experienced in obtaining yarn of uniform quality to suit the dye works. The mill contains 32,700 spindles and 630 looms, but the building is designed to hold additional machinery, the engines and boilers also being large enough for such extension. The capital of the Dyeing and Manufacturing Co. has been raised from 12 to 18 lakhs.

The Karachi Spinning and Weaving Mill Co., Ltd., and the United Spinning and Weaving Mills, Ltd., are the contribution of Sind to new textile mills. The former is at Karachi and its capital is Rs. 12 lakhs of which Rs. 4½ lakhs was subscribed by the Directors themselves. The latter is at Hyderabad, its capital is Rs. 16 lakhs, and it has a Bombay and a Sind Board of Directors.

The Vishnu Cotton Mill, Ltd., Sholapore, capital Rs. 30 lakhs, will start with 30,000 spindles and 750 looms, these being raised eventually to 45,000 and 1,500 respectively. The Pratap Spinning, Weaving and Manufacturing Co., Ltd., is at Amalner. Its capital is Rs. 10 lakhs. A weaving shed has been added to the Gadag Cotton Spinning and Weaving Mills in the Dharwar district.

3. The Kesar Indian Sugar Manufacturing Co., Ltd., was recently started in Bombay under the agency of Messrs. Nagindas and Hargovindas and Co., and with a board of directors composed of well-known local Indian gentlemen. The capital of the company is five lakhs of rupees divided into 2,000 shares of Rs. 250 each. The sugar concern is to be located at Abu Road, where, it is understood, an extensive site has been acquired on very easy terms. To begin with, the Company will confine itself to preparing refined sugar from jaggery or *gur*. The Basin Sugar Manufacturing Co. has been started at Agashi near Bombay.

4. The Bombay Oil Manufacturing Co., Ltd., is formed for the purpose of erecting at or near Bombay (or elsewhere) the necessary buildings, machinery and plant for the extraction of oil and the manufacture of cake from the various oilseeds grown in India. The Company propose to commence operations at the outset in the treatment of cotton seed. The capital is Rs. 4,00,000 divided into 4,000 shares of Rs. 100 each.

A cotton seed oil mill has been started at Broach under the auspices of the Nerbudda Cotton Seed Crushing Co., with a capital of a lakh of rupees. The agents, Messrs. Girdharlal Raichand & Co., are hopeful of a return of 8 to 12 per cent. to the shareholders should they meet with normal conditions on starting business. The mill plant is capable of yielding six tons of oil daily, and in addition to the oil the cotton seed cakes will be about 15 tons' and the husks about 12 tons' weight.

The Goa Coir and Oil Mill Co., Ltd., capital Rs. 2,50,000, has been started at Goa for treating cocoanut and its products. Machinery for crushing husks and turning them into coir yarn, ropes, brush fibre, and extracting oil from copra is to be installed at the commencement, as also a small plant for extracting coal tar and acetic acid from the shells. Later on it is hoped to produce butter from cocoanut oil, soap from waste products, buttons and toys from shells and various drinks from cocoanut water.

5. A new enterprise is projected by the Hon'ble Sir Vitthaladas Thackersey and others for the manufacture of matches on a scale hitherto not attempted in India and by use of machinery not yet known in the country. This is the 'Automat' machine built at Mr. A. Roller's Engineering Works in Berlin. It is the latest invention, and by its use are rendered superfluous a good many of the machines ordinarily required, as it executes automatically in a continuous working process the feeding of the splints, the paraffining, the dipping and the filing of the matches into the boxes without any aid on the part of a workman. The machine only requires attention by workmen in the matter of the supply of splints, paraffine, igniting composition, empty boxes and the removal of the filled boxes. Another noticeable point is that this may serve as a central factory for supply of splints and box material to smaller factories anywhere in the country. These may thus dispense with the wood-cutting part of the business. And it will be to much to their advantage as the cost of transport of splints and box material will be much below that of matches. Altogether this new factory may be expected to revolutionise the conditions of the match manufacturing industry in India. It will be located at some suitable centre in the Punjab, and its capital will be about Rs. 1½ lakhs.

A match factory styled the Karnatic Match Manufacturing Co., has been recently started at Dharwar by Mr. Venkatarao Ramachandra Alagwadi, to be worked by hand power and intended to produce about 50 gross a day. The machinery has been prepared locally by Messrs Tambat Brothers, engineers of Kurla, on the Japanese model.

A match factory, called the Maratha Match Factory, has been started at Asode in Khandesh by the Marathas of that place. Work will be carried on under the supervision of Mr. Tambat, mechanical engineer. The machinery used is made of wood and driven by hand.

6. The work of the Tata Iron and Steel Co., Ltd., is making satisfactory progress. At the first ordinary general

meeting of the shareholders held on the 10th November, it was stated that an analysis by experts has proved the ore in Ramrama manganese property to be of first-class quality. The exploration and development of the coal and limestone properties already acquired are proceeding, and tramways connecting the limestone and manganese properties with the main railways are under consideration. The board have approved of a new site for works near the Kalimati Station instead of near Sini as originally resolved. The new site is 18 miles east of Sini. About 20 square miles on this site have been taken by the Company on a long lease from the Dalbhoom Syndicate. The Manager, Mr. Robert G. Wells, will take charge of the works in January. It is expected that Mr. Sahlin, the Construction Engineer, will also be on the ground at about the same time. Mr. C. M. Weld has already left New York for India, and on arrival, will take charge of the work of developing the iron, coal and limestone properties of the company. The construction by the Bengal-Nagpur Railway at the cost of Government of the Kalimati-Gurumaishini Railway (a distance of 45 miles), has been sanctioned, and work is already begun at the Kalimati end. The design and plans for machinery and plant are being energetically proceeded with by the Construction Engineers; and orders for travelling cranes, rails, fish-plates, stone crushers, weigh bridges, etc., have already been placed. On an average, about 4,000 workmen have been employed on the site for different works.

The Peninsular Iron Works has been started in Bombay with a capital of Rs. 2 lakhs divided into 4,000 shares of Rs. 50 each, with power to increase. The board of directors includes some well-known persons of sound business capacity and they have formed the company with the object of establishing a large and well conducted iron foundry, for which there seems to be a good field. For this purpose they have acquired from Mr. Essaji Tajibhoy his iron works, factory and appurtenances with all their stock-in-trade.

7. Messrs. Thanawala, Shroff & Co., have started the

Indian Felt-Topi Manufacturing Co., in Bombay to manufacture felt caps. An extensive area, in a spacious compound at Parel, has been occupied by the factory, and a building on modern principles was erected to carry on the operations under the immediate supervision of Mr. Janardan Shivdas Thanawala and Mr. Narbheram Pranjivandas Shroff, the principal partners in the concern, who had been to Europe to study the art. The departments of the factory are (1) the engine room and the hot-room; (2) the felt-forming machine; (3) the dyeing department; (4) the polishing department; (5) the finishing department, and (6) the tailors' department. The whole process from the cleaning of the raw material to completion of the finished article is done on the spot. The hats and caps will be made of Indian wool and be of every variety from the coarsest to the finest. The outturn is estimated at close upon 50,000 per month.

The Hindustan Cap Factory of Bombay has put on the market all the usual varieties of felt caps, which are Swadeshi in every detail excepting the ribbon, which is Japanese. The wool is from Khambayat and Hyderabad, and the felt is prepared at Bombay after the wool is refined.

8. The Gujarat Hosiery Factory and Mr. Chimanlal Hiralal Mehta's Hosiery have been started at Ahmedabad. In the latter boys and girls are taught to work on knitting machines and manufacture and sell almost all kinds of hosiery.

Mr. G. N. Potdar, Chemical Engineer, has started at Mahim, Bombay, the Pioneer Alkali Works which manufactures washing soda on a commercial scale. The monthly outturn is 10 tons at present, but it is hoped to increase it to 50. The capital is Rs. 2,000. In course of time Mr. Potdar hopes to turn out Glauber's salt, soda bicarbonate, copper sulphate, iron sulphate and photo chemicals.

A Glass Factory has been started at Talegaon near Poona. from the proceeds of the 'Paisa Fund' under the management of Mr. Iswara Das and an expert from Japan.

A Gas Light Factory has been started at Naosari in Surat district by Mr. Shankar Dayabhai Desai. The gas is prepared from Babool tree wood. Blue-black ink is also prepared from a liquid substance that exudes from the same wood.

The Bombay Brush Manufacturing Co. started in 1906 had been conducting business by hand, but machinery ordered from England arrived and was installed in October last. Brushes of all kinds are made here and are said to compare favourably in price with the imported article.

9. With the object of constructing a light feeder railway $47\frac{1}{2}$ miles in length to serve the districts irrigated by the Southern portion of the Jamrao canal, which is at present untapped by any light railway, the Sind Light Railways, Ltd., has been started.

10. The Swadeshi Life Assurance Co., Ltd., capital Rs. 10 lakhs, the Indian Marine Insurance Co., Ltd., capital Rs. 10 lakhs, and the Hind Life Insurance Co., Ltd., capital Rs. 2 lakhs, are the new insurance companies started in Bombay.

The Indian Specie Bank, Ltd., has opened branches at Calcutta, Lucknow, Indore, Rajkot, and other places—a sign of its increasing prosperity.

11. The business of Messrs. Marsland, Price and Co., Ltd., Constructional Engineers, Merchants and Contractors, has been taken over by a number of Indian businessmen, whose agents will be Messrs. Lalubhai Samaldas & Co. The capital of the new company is Rs. 6 lakhs.

12. A suggestion is reported to have been made to the Bombay Millowners' Association regarding the formation of a company, with a capital of a crore of rupees, for buying waste lands for the cultivation of long-stapled cotton in accordance with the latest and most improved methods of agriculture in vogue in various countries of Europe and America. It is said that the Government Department of Agriculture is willing to cooperate in the matter,

13. The Bombay Textile and Engineering Association has been established in order to afford opportunities for promoting acquaintanceship and frequent interchange of opinion amongst the employees, managers, masters, engineers, foremen, draftsmen and apprentices connected with the diverse textile and engineering trades in all their various branches.

14. The Indian Merchants' Chamber and Bureau have been publishing since July a monthly journal in Gujarati with the object of disseminating a knowledge of useful and important facts and figures touching British Indian trade and finance, as published in diverse English and Indian economic and financial journals. The journal embodies all the important monthly trade returns, cotton and yarn statistics, reports of banks, public companies, etc., besides a review of some important economic or trade topics of the day.

15. The Mandvi Swadeshi Stores was opened at Bombay on Dipavali day.

16. The foundation stone of the Ranchodlal Chotalal Technical Institute, Ahmedabad, was laid by His Excellency Sir George Clarke on the 29th January.

17. An Industrial Exhibition was held at Dhulia at the end of April and its opening ceremony was performed by Rao Bahadur G. V. Joshi of Poona.

MADRAS.

18. The National Fund and Industrial Association has done much useful work as in previous years. Its financial position has improved, the balance in hand on the 31st March being about Rs. 12,250 ; and several thousands of fresh collections were made on the last Dipavali day. 'The total receipts in the year under report were nearly 2½ times as much as the receipts in the previous year while the disbursements were nearly four times as much.' The chief objects on which money was spent were scholarships for students, which were continued throughout the year, and

the All India Weaving Competition to which more references than one have been made in the foregoing pages. The Association maintained three students in Japan who were learning sericulture, dyeing and calico printing, and the manufacture of soaps, candles, pencils, cements, matches, etc. Besides, scholarships are awarded to two students for learning weaving and dyeing in the Victoria Technical Institute, Bombay, and to another who is learning chrome tanning at the Madras Government Tannery at Sembiam. To popularise fly-shuttle looms among the weavers, the Association had sent last year six fly-shuttle looms kindly lent by Government, to the Conjeeveram Urban Weaver's Union and employed a weaving instructor for one year at a cost of Rs. 150.

19. The Madura Industrial Association has opened a weaving factory in which dhoties, laced cloths, etc., required for ordinary use are being manufactured. The factory is fitted up with the improved looms of the modern day with fly-shuttle arrangement and offers a useful field of training to all those who are willing to undergo tuition and practice in the machines at work. The Association also offers stipends to poor students belonging to certain classes, especially the weaver community, and the stipends range from Rs. 2 to 10 Rs. per mensem. Weavers of some experience of the ordinary country loom, who want to undergo training in fly-shuttle looms, can avail themselves of the offer of stipends which in their case will not be less than 5 rupees a month.

The Indian Weaving Co., Ltd., is started at Madras with a capital of Rs. 25,000 with the object of meeting the growing demand for Swadeshi cloths. The National Fraternity and Weaving Factory, Madras, capital Rs. 10,000, has the same object in view. Another well conducted factory is the Tanjore Weaving Factory, which is also a school affording free instruction to those who are willing to learn weaving on fly-shuttle looms. Mr. T. Roberts, a retired sub-magistrate has set up the Mangalore Weaving Company

which turns out checks, imitation tweeds, *saris*, etc., of excellent quality. Mr. K. Rangarao's Industrial Institute for the Depressed Classes is another place where improved looms have been set up for weaving checks, etc. At Negapatam and Vizagapatam too a few improved looms are worked. At the former place Hattersley's looms are used. A Mr. Sitharamaswami in the Ganjam District also works on Hattersley's looms and finds them satisfactory. At Coimbatore the foundation stone of the Kaleeswara Mills, Ltd., to which reference was made in last year's report, was laid, and the capital of the Coimbatore Spinning and Weaving Co. has been increased by Rs. 3 lakhs.

20. The weavers, called Devangas, of Coimbatore have formed an association called the Devanga Mahasabha with the object of improving education among their castemen, developing their industries, settling disputes by arbitration, etc. There are 3,000 Devanga families at Coimbatore. The Mahasabha has decided to provide free primary education to all boys of the community between the ages of five and 12. 'Each male child of the community must be educated both in English and the vernacular.' As regards the development of industries, we read—

'With a view to introducing better methods of weaving among the community whose sole employment at present consists in this, the General Committee has notified its intention of appointing a sub-committee of influential gentlemen engaged in the profession or as merchants to advise them on the question of having a factory of improved looms, where the members of their community might be taken as apprentices and taught the working of such improved looms. They also consider it desirable to start a limited liability company for twisting and dyeing yarn and silk in order to prevent the members of the community from getting their twists and dyed yarn and silk from outside Coimbatore at a cost which the Committee consider leaves no room to the workmen for getting any profits out of. The community will then be prohibited from getting their supplies from anywhere except the Company. The Committee also state that the women of the community should be given some such home work as dyeing or making lace and be prevented from going out to work as coolies.'

For capital the Company has made arrangements to collect donations from the members of the community. It

has also framed a set of rules for the collection of funds. The merchants of the community will be required to pay to the Sabha a royalty of $\frac{1}{4}$ per cent. on the total amount of their transactions, besides a small percentage on the articles received or sent out by them. At every marriage in the caste the contracting parties must ordinarily contribute Rs. 7-1-0 jointly. In order to secure a capital of Rs. 25,000 the General Committee called for donations from the members, and Rs. 24,975 was subscribed by them. No doubt the working of this association will be watched with the utmost interest.

21. The Swadeshi Steam Navigation Company of Tuticorin is making steady progress. Its most pressing need is more capital. On the result of the vigorous efforts that are being put forth by a number of devoted workers to get the full amount of the registered capital subscribed by the public will depend the ultimate fate of this remarkable enterprise.

A new oil company with a capital of Rs. 50,000 has been registered in Kistna. It is to be known as the Mutyalpalli Oil Manufacturing Co., Ltd. The Indian Industries, Ltd., is a concern started at Chidambaram with a capital of Rs. 20,000, with the object of working an oil mill. It is hoped gradually to enlarge and extend the business.

At Conjeeveram a Bell Metal Factory has been started.

At Masulipatam and Karkal two soap factories have been started. And so is one at Mangalore.

Mr. B. V. Nath's Industrial Laboratory at Vizianagram turns out perfumes, etc.

The Reliance Manufacturing Co. has been started at Kumbakonam to make and sell a variety of articles of domestic use.

A sugar factory employing Mr. Hadi's processes is working at Sorapet, near Madras. The proprietors are Messrs. T. R. Tawker & Sons of Madras.

A demonstration of the same processes was given at Udampalpet near Coimbatore by an officer of the U. P. Agricultural Department at the instance of the Coimbatore Agricultural Association.

22. Dr. M. C. Nanjunda Rao of Mylapore, Madras, has introduced carpet-weaving as a home industry for middle-class Hindu families. In October 1907 he obtained the services of a professional weaver from the Madras School of Arts to teach his daughter and two of her companions carpet-weaving and the dyeing of wool. In a short time the girls learned both processes, and Dr. Nanjunda Rao at once set up a simple apparatus of the ordinary country pattern, at a cost of only Rs. 2, and supplied the girls with a quantity of wool. Having treated the wool with the different colours required, the girls started weaving under the guidance of their master, and in a few days were able to continue the work practically independently, except for occasional advice and help. In about three months' time they were able to make three nice-looking carpets. Encouraged by the success that so far attended his efforts, Dr. Nanjunda Rao has arranged to import machinery for the purpose of teaching the manufacture of socks, tape, candles, soap, matches, etc. What Dr. Nanjunda Rao is aiming at is to establish the practicability of such industries being practised by middle class women at their homes. Work more or less on the same lines is carried on at the place of Mr. N. Patta-bhirama Rao, late Dewan of Cochin.

23. The Committee on Industrial Work of the South Indian Missionary Association have set on foot an inquiry, which is of the nature of a limited industrial survey, into the industrial work undertaken by Missionary bodies in that part of the country. The inquiry has reference to the aim or purpose of the work, the methods employed to attain the end in view, the results secured, the relation of the industrial work to the general Mission work and Mission body, cooperation among Missions, use of non-Mission agencies, problems and needs of the future, and general questions of

policy and management. The inquiry is expected to be completed by the end of this year.

BENGAL.

24. The Boot and Equipment Factory Co., Ltd., has been formed with a capital of Rs. 5 lakhs with the object of manufacturing leather : boots, shoes, saddlery, bags, port-manteaus and other articles 'equal to European finish and at less price.' The Company started work on the 1st February and the Stewart Factory of Agra has been amalgamated with it. Indian experts trained in America, England and Japan at the instance of the Association for the Advancement of Scientific and Industrial Education are employed by the Company.

25. The Bengal Hosiery Co., Ltd., Calcutta, capital Rs. 2 lakhs, has been formed to establish a hosiery factory in Calcutta. The machinery which the company is importing will be chiefly adapted to the manufacture of hosiery of a cheap description having the largest sale in the market. In order, however, to maintain a supply of finer qualities the promoters have concluded arrangements for the acquisition of the Kidderpore Hosiery Factory which possesses machinery suitable only for the manufacture of finer makes.

26. The Behar Industrial and Agricultural Development Co., Ltd., has been formed at Gaya with a capital of Rs. 20,000. For the present an Oil Mill will be started near Sone East Bank Station, which is within easy reach of the coal mines of Daltonganj and the oil seeds marts. Plenty of fallow land is available and labour is cheap.

The Maharajah of Cossimbazar proposes to start a central nursery with some subordinate nurseries and to lay out mulberry plantations estimated at a cost of a lakh of rupees.

Mr. Shama Charan Das, the inventor and proprietor of the Binapani records, has set up a workshop in Calcutta.

where he manufactures the plates for gramophone records, both sides of the discs being used for the purpose. The materials used are strictly Indian and the quality of the plates is said to be excellent.

27. The Mahajani Steam Flotilla is the newest of Swadeshi steamship companies in Bengal. It plies its vessels between Khulna and Narayanganj.

28. A wealthy Marwari merchant by name Mr. Trikamdas Kallianji, has erected a cotton mill at Mahesh near the railway line between Serampore and Rishra. It has been arranged to add 800 looms and 20,000 spindles, including dyeing and bleaching arrangements, at an estimated cost of Rs. 6 lakhs. The mill at present contains 200 looms and 20,000 spindles.

The fly-shuttle loom has been introduced in the jail at Angul with success.

The Report on the Land Revenue Administration of Eastern Bengal and Assam for the year 1906-07 says that in some districts the weaving industry has of late received a considerable impetus. The demand for *mainamati* cloth, manufactured in Tipperah, has improved. In Pubna weaving has increased and a company has been started for the manufacture of stockings and vests. In Noakhali weavers are reported to be in a better condition and the export of cloth from Dacca, Mymensingh and Faridpur is noticed.

The Report adds that formerly a large quantity of mustard seed was exported from the Assam Valley, but this export has decreased after the establishment of oil mills at Gauhati.

29. The Association for the Advancement of the Scientific and Industrial Education of Indians continues to do its very useful work. Eighty students have been sent to foreign countries this year for receiving instruction in various industries. Of its position and work generally, Babu Narendro,

Nath Sen, the President of the Association, said at its last annual meeting :

'The financial position of the Association was sound, the receipts during the year amounting to Rs. 49,887 and the expenditure to Rs. 30,818. There had been a steady rise in contributions and the receipts from the District Committees went up from Rs. 2,100 to Rs. 8,946. Much progress had been made during the year in the agricultural settlement near Deoghur. The Small Industries Development Company would start work within a month. Machinery for pencil and button making had been purchased. The boot and shoe equipment factory had already been started. A museum for indigenous products was on a fair way of being opened.'

It has been advertised that next year the association will award two scholarships of Rs. 190 each, five of Rs. 50 each and 10 of Rs. 25 each, besides 50 passages, all for technical education in foreign countries.

A large sum of money has been raised by public-spirited men in Behar to award scholarships to Behari young men for receiving technical education. The scholarships will be named after Sir Andrew Fraser.

30. There was an Industrial Exhibition at Hooghly in February and another at Sherpur in the Mymensingh district in April. The Bengal National College held an exhibition in February of the scientific apparatus made by students of the institution. The articles were spoken of highly by Professor Brühl of the Sibpur Engineering College among others.

At Barpather in Assam a sugar demonstration by the Hadi process was organised by the Department of Agriculture, Eastern Bengal and Assam, and was ably conducted by an officer deputed by the U. P. Department of Agriculture.

THE UNITED PROVINCES.

31. The Prayag Sugar Company, Ltd., Allahabad, capital Rs. 3 lakhs, has been formed to manufacture sugar from *gur*,—not from cane, as in India it has been found more profitable to make sugar from *gur* than from cane direct, as with *gur* the factory can work the whole year round, while with cane it can work for four or

where he manufactures the plates for gramophone records, both sides of the discs being used for the purpose. The materials used are strictly Indian and the quality of the plates is said to be excellent.

27. The Mahajani Steam Flotilla is the newest of Swadeshi steamship companies in Bengal. It plies its vessels between Khulna and Narayanganj.

28. A wealthy Marwari merchant by name Mr. Trikamdas Kallianji, has erected a cotton mill at Mahesh near the railway line between Serampore and Rishra. It has been arranged to add 800 looms and 20,000 spindles, including dyeing and bleaching arrangements, at an estimated cost of Rs. 6 lakhs. The mill at present contains 200 looms and 20,000 spindles.

The fly-shuttle loom has been introduced in the jail at Angul with success.

The Report on the Land Revenue Administration of Eastern Bengal and Assam for the year 1906-07 says that in some districts the weaving industry has of late received a considerable impetus. The demand for *mainamati* cloth, manufactured in Tipperah, has improved. In Pubna weaving has increased and a company has been started for the manufacture of stockings and vests. In Noakhali weavers are reported to be in a better condition and the export of cloth from Dacca, Mymensingh and Faridpur is noticed.

The Report adds that formerly a large quantity of mustard seed was exported from the Assam Valley, but this export has decreased after the establishment of oil mills at Gauhati.

29. The Association for the Advancement of the Scientific and Industrial Education of Indians continues to do its very useful work. Eighty students have been sent to foreign countries this year for receiving instruction in various industries. Of its position and work generally, Babu Norendro,

Nath Sen, the President of the Association, said at its last annual meeting :

'The financial position of the Association was sound, the receipts during the year amounting to Rs. 49,887 and the expenditure to Rs. 30,818. There had been a steady rise in contributions and the receipts from the District Committees went up from Rs. 2,100 to Rs. 8,946. Much progress had been made during the year in the agricultural settlement near Deoghur. The Small Industries Development Company would start work within a month. Machinery for pencil and button making had been purchased. The boot and shoe equipment factory had already been started. A museum for indigenous products was on a fair way of being opened.'

It has been advertised that next year the association will award two scholarships of Rs. 190 each, five of Rs. 50 each and 10 of Rs. 25 each, besides 50 passages, all for technical education in foreign countries.

A large sum of money has been raised by public-spirited men in Behar to award scholarships to Behari young men for receiving technical education. The scholarships will be named after Sir Andrew Fraser.

30. There was an Industrial Exhibition at Hooghly in February and another at Sherpur in the Mymensingh district in April. The Bengal National College held an exhibition in February of the scientific apparatus made by students of the institution. The articles were spoken of highly by Professor Brühl of the Sibpur Engineering College among others.

At Barpather in Assam a sugar demonstration by the Hadi process was organised by the Department of Agriculture, Eastern Bengal and Assam, and was ably conducted by an officer deputed by the U. P. Department of Agriculture.

THE UNITED PROVINCES.

31. The Prayag Sugar Company, Ltd., Allahabad, capital Rs. 3 lakhs, has been formed to manufacture sugar from *gur*,—not from cane, as in India it has been found more profitable to make sugar from *gur* than from cane direct, as with *gur* the factory can work the whole year round, while with cane it can work for four or

five months only.' 'The most important point is that no animal charcoal will be used in the process of refining.'

The Ganges Sugar Works, Ltd., Unao, 'the largest sugar refining concern in the United Provinces,' the construction of which was completed in August, has begun operations and is refining 500 maunds of jagri daily. The works are designed on the most modern principles. The managing agents are Messrs. Baldevdas Kedarnath of Cawnpore.

A sugar factory employing the Hadi process has been started at Baran by Thakur Raghu Prasad Narayan Singh. It employs 84 men and was erected at a cost of Rs. 9,000. All the cane comes from the fields within a radius of two miles from the factory. It appears that the Thakur is able to make 18·62 per cent. on his working expenses. Other factories of a similar character have been started at Amethi and Bulandshahr.

There were Hadi process demonstrations at Daulatpur and Amroha.

32. The Moradabad Spinning and Weaving Mills Co., Ltd., has been started with a capital of Rs. 5 lakhs. It is hoped that the mill will be in full working order in the next cold weather. The Directors say:

'It is a fact that Moradabad is a central place for distribution of yarn to different places and that cotton in and near Moradabad District is the best cotton for making yarn in the United Provinces. When we see that in Delhi, Hathras, Agra and Cawnpore, like mills are giving profits it is confidently hoped that with such a strong Board of Directors and with cheap labour and sure demand of yarn at Moradabad the profit to this Company shall be still greater.'

The Oudh Ginning and Pressing Mills, Ltd., has been started at Hardoi. The enterprise is due mainly to the efforts of Nawab Abdul Karim Khan of Shahabad.

33. The Kashi Glass Manufacturing Co., Ltd., capital Rs. 2 lakhs, has its registered office at Benares, but the factory will be erected near Asansol, it being the most suitable locality for the purpose. The work will be in charge of Babu Saligram Sinha, who completed his education at the

Imperial University, Tokio, and received a special training in glass making in the Higher Technical School, Tokio, and a practical training in two well known glass factories in Japan for three years and a half.

34. Babu Mahesh Charan Sinha after return from Japan and America where he received practical training in several branches, has started an iron works at Allahabad.

35. The Vaisya Maha Sabha has started a Technical, Commercial and Scientific Education Fund for the benefit of young men of the Vaisya community. Scholarships will be awarded for education in India as well as in foreign countries. At present preference will be given to the following branches of industry :—Sugar refining, cotton and wool spinning and weaving, calico printing and dyeing, paper manufacture and small hardware and cutlery. The scholarship holder will have to pay to the Sabha one-fifth of his monthly income till such time as the scholarship amount received by him has been refunded with interest at 5 per cent. Besides, he has to give training to other students selected for the branch of the industry in which he has qualified himself.

36. A Hindi trade journal has been started at Benares by Babu Thakur Prasad with the support of Rai Bahadur Lala Baij Nath. It is issued once a month.

37. A Swadeshi Mela and Exhibition was held at Cawnpore in the earlier part of the year.

THE PUNJAB.

38. The Peshawar Sugar Manufacturing Co., Ltd., has been registered at Peshawar with a capital of Rs. 2,50,000 for the manufacture of sugar. The manufacture of ice also forms part of the business of the company.

39. The Shankar Nath Foreign Technical Education Fund has been started at Delhi to commemorate the public services of the late Mr. Shankar Nath. The object of the Fund is to enable duly qualified Indian students to learn in foreign countries such industries as can be profitably de-

veloped in India, preference being given to students of Delhi city and in the alternative of Delhi district. The student who receives a scholarship has to undertake 'to work for the development of the industries of the country either by working in a manufactory or farm or imparting instruction in his particular industry.' He has also to repay the amount advanced to him by instalments and with interest when he has begun to earn a certain sum.

THE CENTRAL PROVINCES AND BERAR.

40. The Akola and Mid-India Spinning, Weaving and Manufacturing Co., Ltd., was opened a few months ago at Akola with 21,408 spindles and 418 looms. The mill is estimated to be capable of dealing with fully 10,000 bales of cotton in the year. Large and sanitary quarters are being erected for the employees of the mill. It is also the intention of the management to open a store in the grounds, where commodities of every description will be supplied to the employees at the lowest possible cost.

Weaving is now in full operation in Rai Bahadur Bansilal Ahirchand Spinning and Weaving Mills, which are located at Hinganghat, Wardha district.

The Central Provinces Swadeshi Spinning, Weaving and Manufacturing Co., Ltd., Nagpur, was wound up and sold to Messrs. B. D. Petit, Sons and Co. The new company is styled the Petit Swadeshi Spinning, Weaving and Manufacturing Co., Ltd., Nagpur.

41. The C. P. Iron Works and General Trading Co., Ltd., Nagpur, has been formed with a capital of one lakh of rupees to carry on work in the following Departments:—mechanic shop where articles of metal will be manufactured and all mechanical repairing done; foundry where all manner of casting will be done; carpentry where coach building of every description, painting and repairing work in connection therewith and cabinet making will be carried out; hardware depôt; coal and timber agencies.

42. The Amraoti Technical Institute, to which refer-

ence was made in the report for 1906 is ready to start work. The curriculum has been settled, the staff has been engaged, and the Institute will be opened early next year.

43. Steps have been taken for the formation of a mining association for the Central Provinces. For the present only certificate-holders for minerals and qualified mining engineers holding diplomas are eligible for membership, but the committee has discretion in regard to the admission of others besides these. The Association will, besides safeguarding mining interests, be addressing Government on various matters connected with the mining industry.

THE INDIAN STATES.

44. **The Nizam's Dominions.**—The Hyderabad Industrial and Commercial Co., Ltd., has been formed chiefly to manufacture carpets for sale in the markets of Europe and America. The company has imported looms from Kashmir, and skilled workmen from the Punjab, on the guarantee offered by American friends that they would keep the company supplied with orders at higher rates than those paid for Warangal carpets, which, once famous, have since lost ground in America. The company have introduced some changes in the method of manufacture and are able to produce superior carpets. The company has been earning over 12 per cent. The agents are Messrs. Thattey & Co.

45. **Mysore**—The Mysore Tannery, Ltd., has been started at Bangalore with the object of organising and developing the leather industry on modern lines. Both bark and chrome tanning will be done. The boot factory of the company will manufacture boots, shoes, harness, saddlery, brief bags and other leather goods of various descriptions and at prices to suit all tastes and purses.

46. **Baroda**—A flour mill, an umbrella factory, and a fibre industry are engaging attention in Baroda. The number of private factories using steam has increased, and a chrome tanning factory is in course of erection.

47. **Kathiawar.**—An enterprising Indian has obtained a 99 years' lease of a piece of land in *Rajkot* State, together with a monopoly for 15 years, to start an oil mill and soap and candle factories. The same gentleman has been negotiating with the State authorities for the right to construct a steam tramway between *Rajkot* and the *Beti* river.

A 'Dolls, Toys and Button Factory, Ltd.,' has been established at *Rajkot* with a capital of Rs. 5,000. The Joint Agents and Secretaries are Messrs. K. M. Chatterjee and P. L. Joshi.

An iron foundry has been established under Indian control in *Gondal* State.

A soap factory, 'which promises well,' has been opened in *Idar* State.

48. **Central India.**—A company named the *Malwa Agricultural and Industrial Corporation, Ltd.*, has been formed at *Neemuch* with a capital of Rs. 10 lakhs to promote agricultural development. The company has obtained on favourable terms possession of 81 villages in the districts of *Ojjain* and *Mandsar* from H. H. the Maharajah *Scindhia* on favourable terms. The Corporation is going to have 200 villages more to expand its work. *Syed Mohamad Mir, Vakil of Meerut*, is the Managing Director of the concern.

The *Central India Hosiery Co., Ltd.*, has lately been registered at *Indore*.

49. **Chota Udepur.**—Applications have been recently received by the *Durbar* to start a factory for ginning cotton, for extracting oil from *Mhowra* fruit, making varnishes from lac, pottery, etc. One of the applicants contemplates the manufacture of glass from *Silica*, which can be quarried in abundance from the neighbouring hills.

AMBALAL SAKERLAL DESAI,

AHMEDABAD,
The 14th December 1907. }

President, The Third Indian
Industrial Conference.

AMRAOTI,
The 12th December 1907. }

R. N. MUDHOLKAR,
General Secetary,
Indian Industrial Conference.

APPENDIX I.

No. 5184 of 1908.

GENERAL DEPARTMENT.

Bombay Castle, 17th August 1908.

To

Rao Bahadur R. N. Mudholkar, B.A., LL.B., General Secretary, Indian Industrial Conference, held at Surat, in December 1907, *Amraoti*.

SIR,

I am directed to inform you that Government have had under their consideration the Resolutions passed at the Indian Industrial Conference held at Surat on the 30th December last, a copy of which was submitted to them with your letter No. 70, dated the 26th January 1908.

2. With reference to Resolution No. I, I am to invite your attention to Government Resolution No. 4377, dated the 1st July 1908, on the subject of the Industrial Survey of the Bombay Presidency, a copy of which was forwarded to you with Government letter No. 4379, dated the 1st July 1908.

3. With reference to Resolution No. II, relating to Technical and Commercial Education, I am to refer you to Government Resolution, Educational Department, No. 1353, dated the 20th July 1906, published at pages 212-239 of the *Bombay Government Gazette* of 26th September 1906, Part VII, dealing with this subject.

4. With reference to Resolution No. III (Agricultural Education), I am to state that it is the announced policy of Government to extend agricultural stations as soon as trained men are available for this purpose. The best method of spreading among the cultivating and landholding classes a practical knowledge of the principles of scientific agriculture and modern methods was discussed at the Agricultural Conference held at Ahmedabad in November 1907 and a copy of the proceedings of that meeting is appended. Government are devoting their attention to the development of the Agricultural College at Poona. Agricultural schools cannot be started without teachers and text-books, and these are being gradually provided by the College, but until the advantages of

primary education have been largely extended among the cultivating classes, the establishment of agricultural schools cannot produce much result. In the meantime the Agricultural Department is arranging to give instruction on the Agricultural stations with reference to specific points, such as the selection of seed in any way not at present commonly practised or the cultivation of a new crop. Specific instruction, *plus* demonstration which may continue for a few months, is the line of work which the Department has in view for the immediate future.

5. Concerning Resolution No. IV on the subject of Agricultural Banks, I am to point out that the working of the Urban and Rural Cooperative Credit Societies in this Presidency is explained in the Press Note No. 1211, issued by Government on the 4th February 1908. A copy of this note is appended, together with a copy of the Annual Report of the working of these Societies for 1906-07. The question of starting Agricultural Banks to help these Societies is under consideration.

6. Regarding Resolution No. V (c) which deals with the Mining Industry, I am to say that Government are quite willing to encourage indigenous mining enterprise, but cannot promise preferential treatment without a more precise indication of what is meant by this expression.

7. With reference to Resolution No. VI on Cotton Spinning and Weaving, the Annual Report of the Department of Agriculture in the Bombay Presidency for 1906-07 describes the measures taken by Government in developing cotton cultivation in that year and a copy of the Report is appended. It is not understood what is meant by the restrictions retarding the expansion of the Cotton Spinning and Weaving Industry referred to in the concluding part of No. VI.

8. Government have noted the views of the Conference regarding the provision of facilities for affording practical instruction in weaving by the establishment of weaving schools at every important weaving centre and will consider them in connection with the results of the Industrial Survey of this industry.

9. Referring to Resolution No. VII (a) dealing with the Sugar Industry, I am to observe that the question of the improvement of the Indian Sugar cane Industry was considered by a Sub-Committee appointed by the Board of Agriculture at Cawnpore in February 1907, a copy of whose proceedings is appended. The Report of the Sub-Committee was adopted by the Board subject to the modification that sugar-cane experiments on the scale contemplated by the terms of refer-

ence should be started only in tracts where the crop was of commercial importance. The Board also suggested that Local Governments might consider the advisability of granting concessions to pioneer central sugar factories, when suitable tracts for the establishment of such factories are discovered. The Director of Agriculture in this Presidency has been requested to consider carefully the recommendations of the Board. His attention is at present occupied with manual experiments. When these are completed, questions in connection with the cultivation of cane, its improvement by chemical selection and possibly the manufacture of sugar, will be taken up. The suggestions made by the Board regarding the grant of concessions to pioneer central sugar factories will be considered when specific application for such concessions is made.

10. Concerning the first portion of Resolution No. VII (b) regarding the provision of more extensive irrigational facilities for the development of the sugar industry, I am to observe that Government are fully aware of the importance of extending irrigation not only for sugar-cane but for all crops, and canal projects have already been sanctioned and are under construction at Chankapur on the Girna, the Godavari canals in Nasik and Ahmednagar, and the Pravara in Ahmednagar. Further reports are under preparation for submission to the Government of India, who are equally desirous of extending irrigation by any schemes which can be shown to be sound financially.

11. With regard to the imposition of a duty upon imported sugar referred to in the latter portion of Resolution No. VII (b), I am to remark that under item No. 8 of schedule IV of the Indian Tariff Act a duty of 5 per cent. is already levied on imported sugar. Besides this rate of duty, the Government of India have power under section 8-B of the Tariff Act to levy special duty on imported sugar in certain cases. I am to add that this power has been exercised in the case of sugar imported from Denmark, the Argentine Republic and Russia.

I have the honour to be,

Sir,

Your most obedient servant,

R. E. ENTHOVEN,

Secretary to Government.

THE INDIAN INDUSTRIAL CONFERENCE.

No. 1144 of 1908.

From

RAO BAHADUR R. N. MUDHOLKAR,
General Secretary, Indian Industrial Conference.

To

THE SECRETARY TO GOVERNMENT,
General Department,
 BOMBAY.

Dated AMRAOTI, the 11th September 1908.

SIR,

In continuation of my letter No. 1119, dated the 24th August 1908, I have the honour to submit the following observations on your letter No. 5184, of the 17th August 1908, touching the Resolutions of the Surat Industrial Conference.

2. The members of the Conference feel very grateful to the Government of Bombay for instituting a survey of the textile industry of the Presidency. It is, however, submitted that it will take a very long time to complete the investigation of all the existing and feasible and possible industries if they would be dealt with one at a time. I would, therefore, respectfully venture to suggest that the survey of industries as a whole or at any rate of the more important ones may be taken up along with that of the textile industry, so that the industrial survey of the Presidency may be completed at a fairly early date and measures adopted on the basis of the information thus obtained for the promotion of those industries for the development of which favouring conditions may be found to exist.

3. With reference to paragraph 3 of your letter dealing with Resolution II of the Conference I have again great pleasure in giving expression to the appreciation of the Conference of the interest which the Government of Bombay have taken in the promotion of technical and industrial education. In the annual report prepared by me for submission to the Conference in November 1906 the liberal grants made by that Government by their Resolution No. 1353 of 20th July 1906 were thankfully acknowledged. The recent Resolution in regard to commercial education is also greatly encouraging. The progress, however, which has to be made before the provision for technical and commercial education can adequately meet the urgent requirements of the country is so great that I might be permitted to press upon Government the prayer of the Conference for more and increased

grants for this great object. A further development of the Victoria Jubilee Technical Institute of Bombay or of the College of Science of Poona so as to make it a fully equipped technological college imparting instruction theoretical and practical in industrial chemistry, mining and naval engineering and the higher branches of mechanical and electrical engineering and the textile manufacture, the expansion of the technical schools at the more important towns in the mofussil such as Ahmedabad, Surat, Poona, Sholapur, &c., the bifurcation of studies in the high school classes so that boys who may not desire to take a University course may be imparted instruction in some useful trade or industry the practice of which will enable them to earn a decent living, the establishment of a college of commerce at Bombay and the institution of a faculty of commerce by the University are among the measures which call for early consideration and action in the near future. They will, it is recognised, necessarily involve considerable increase in the expenditure on education. But when the comparative smallness of the present outlay in India on technical and commercial education is taken into consideration the desirability—I would say the necessity—of this increase will not be open to question. There is fair ground to hope that when the improvements and developments suggested above are decided upon and sanctioned the citizens of Bombay and of the presidency generally will come forward with their characteristic public spirit and generosity and make liberal contributions. Perhaps the most effective way of securing this cooperation would be to summon a conference of representative educationists, industrialists and experts—official and non-official—similar to the Naini Tal Conference of last year and the Conference summoned next week at Ootacamund by the Government of Madras. His Honour the Lieutenant-Governor of Eastern Bengal and Assam announced in a recent speech that a Committee would be appointed after October next to deliberate upon and devise a suitable scheme of technical and commercial education.

4. Coming to paragraph 5 of your letter I beg to express the sense of satisfaction with which the members of the Conference will receive the intimation conveyed therein of the fact that the question of starting agricultural banks to help cooperative credit societies is under the consideration of the Government. It is believed that there will not be wanting enterprising capitalists who are willing to establish such a bank in Bombay on a large scale if the Government favourably consider the scheme and make concessions similar to those accorded to the Bank projected by Sir Ernest Cable. I have also great pleasure in acknowledging what Government are doing and propose to do in the matter of agricultural education,

5. By preferential treatment of indigenous mining enterprise the Conference meant that in disposing of applications for prospecting licenses and mining leases Government will be pleased to give preference to the applications and offers of statutory natives of India over those from foreigners. The expression of the Government's willingness to encourage indigenous mining enterprise contained in paragraph 6 of your letter will be very gratifying to the members of the Conference.

6. The reference to 'the restrictions retarding the expansion of the cotton spinning and weaving industry' in Resolution VI of the Conference had chiefly in view the excise duty on cotton goods, which acts as a great disadvantage to the indigenous cotton mill industry in its competition with that of Europe and America. The removal of the cotton duties in 1879 was against the advice and views of the majority of the Council of the Governor-General and of several members of the Council of the Secretary of State and the imposition of the Excise Duties in 1894 was strongly objected to and resented by all classes in India. Over thirty lakhs of rupees is derived by Government from this duty, and it is submitted that it is a heavy tax unjustly and unnecessarily levied on what is after all a young industry still. Considerations neither of revenue nor of free trade justify this impost in the opinion of the members of the Conference, and as the mill industry is mostly a Bombay industry, they will feel deeply grateful if His Excellency the Governor in Council will be pleased to take such action as to him may seem feasible or proper to get it removed by the higher authorities who are responsible for its existence.

7. Some of the provisions of the Indian Factories Act and the Rules thereunder are not calculated to smooth the way for nascent industries and are at times vexatiously worked. The Conference had some misgiving about the outcome of the Factory Labour Commission who it was feared might recommend a legislative restriction of the hours of work of adult male labourers—a step to which it would have been opposed. It is satisfactory that no such recommendation has been made by the Commission.

8. The members of the Conference are grateful to the Government of Bombay for expressing their readiness to consider the grant of concessions to pioneer central sugar factories when specific applications for such concessions are made. I beg to invite the attention of Government to the request of the Conference that owners of sugar factories might be permitted to utilise bye-products. If they be permitted to manufacture rum the factories will become more remunerative. As regards the imposition of import duties on foreign sugar I am to say that the prayer of the Conference was that the desira-

bility of special, heavy import duties in addition to the 5 per cent. customs duty might be considered by the Government. Such a course would be justifiable and warranted by the circumstances of this country and the fiscal policy which other countries have seen it proper to adopt. A parliamentary white paper recently issued shows that Russia levies on Indian products exported to that country duties which amount to 300 per cent. of their value. Even the United Kingdom levies on Indian sugar a duty of 27 per cent. The special duty levied under section 8 B of the Tariff Act on sugar imported from Russia which is referred to in para. 11 of your letter has since its receipt been removed. The latest figures of imports of sugar show that India's most formidable competitors are at present Java and Mauritius and it is their cane sugar that will have to be subjected to a special duty if protection is to be given to the indigenous industry. The members of the Conference will feel very grateful if this large question is favourably considered by the Government.

I have the honour to be,

Sir,

Your most obedient servant,

R. N. MUDHOLKAR,

General Secretary,

Indian Industrial Conference.

No. 7041 of 1908.

GENERAL DEPARTMENT,

BOMBAY CASTLE, 27th November 1908.

To

RAO BAHADUR R. N. MUDHOLKAR,

General Secretary,

Indian Industrial Conference, AMRAOTI.

Sir,

With reference to your letter No. 1141, dated the 11th September 1908, I am directed to inform you that the further expression of views on the part of the Indian Industrial Conference has been noted and will be considered in due course.

I have the honour to be,

Sir,

Your most obedient servant,

A. KING,

For Secretary to Government.

APPENDIX II.

THE INDIAN INDUSTRIAL CONFERENCE.

OFFICE OF THE GENERAL SECRETARY,

Dated, Amraoli, the 1st February 1908.

From

RAO BAHADUR R. N. MUDHOLKAR,

General Secretary, Indian Industrial Conference.

To

(The Secretaries of the Several Provincial Committees.)

SIR,

In sending for the information of your Committee copies of the Resolutions passed at the Third Indian Industrial Conference which was held at Surat on the 30th December 1907, the Annual Report for last year which was presented to and adopted by it, the second edition of the "Directory of Indian Goods and Industries" which was prepared in this office and published some days ago, and a few copies of the Summary of Proposals contained in the papers laid before the Second Indian Industrial Conference held at Calcutta in December 1906, I desire to invite your attention to my letter of October last (*vide* Appendix VI of the Annual Report) and request you to give me the benefit of the views of your Committee on the questions dealt with therein.

2. While it will be conceded I think that some useful work has been done since the first Industrial Conference was held at Benares in December 1905, it is imperative that the scope of its work should be extended and organised systematic endeavours made to produce more tangible results than has been possible till now. Firstly, a "greater degree of cooperation between the central office and the Provincial Committees" must be secured by the appointment of an additional Assistant Secretary as contemplated by Resolution VI of the Calcutta Conference. As His Highness the Gaekwar observed in his Inaugural Address on that occasion the want of close touch between this office and the Provincial Committees is the weak point of our organization at present and must be remedied.

3. The second question I would invite your attention to relates to the publication of a quarterly Bulletin of Industrial Information in accordance, again, with Resolution VI of the Calcutta Conference. This it was not possible to do last year, and a great deal of disappointment has been caused thereby in

several quarters. It is I think essential that a start should be made without further delay. I would ask your consideration of the fact that the Conference has, and as a body can only have, for its principal object the collection and dissemination of useful information on industrial questions and the creation and education of public opinion thereon, and that we should not neglect any means by which this object can be served. That a quarterly Bulletin of Industrial Information is calculated admirably to fulfil it, will not I think be questioned. Both the appointment of an additional Assistant Secretary and the publication of the Bulletin can only be made by the requisite funds forthcoming, and I shall be obliged by your telling me what sum your Committee will undertake to contribute towards the cost of these two proposals.

4. As a most important part of the same educative work of the Conference the suggestion has been made (*vide* para. 5 of my letter referred to above) that translations should be made of selected publications of the Conference and the vernacular renderings broadly distributed. I venture to repeat that regard being had to the number of vernaculars, the work of translation can only be undertaken by the Provincial Committees. It is a fair division of labour and responsibility between the Central office and the Provincial Committee that the former should publish things in English and the latter should issue the vernacular renderings thereof. Thus the Bengal Committee may make arrangements for translating our Reports and Directories into Bengali and publishing the same; the Bombay Committee for doing the same in Marathi and Gujarathi; the Madras Committee in Tamil and Telugu; the United Provinces Committee in Hindi and Urdu. I request you to acquaint me with the decision of your Committee on this matter.

5. Coming to the Resolutions of the last Conference I will call your particular attention to the first and clause (b) of the second resolution. The Secretary of State and the Government of India have expressed in unmistakable language their desire that industrial surveys of the areas within their jurisdiction should be instituted by the Provincial Governments, but the Governments of the two Bengals, of Bombay and Madras and of the Punjab, have as yet not taken action in the desired direction. I am sanguine enough to think that it only requires some moral pressure to be brought to bear on them by public opinion in the respective provinces for the survey to be set on foot. You will find appended to the annual report sent herewith (*vide* Appendix I) the memorial which the Hon'ble Mr. Vithaldas Damodher Thakersey and I recently submitted to the Government of India on this subject. I suggest for the consideration of your Committee

the desirability of their sending a similar representation to your Provincial Government.

6. Clause (b) of Resolution II has reference to the Industrial Conference held at Naini Tal by the Government of the United Provinces. The Government of India having committed themselves to the view that the recommendations of the Committee on Industrial Education were in the main unsuitable to the present circumstances of the country, and there being no other definite scheme before the Government, it is I venture to think the best way of pushing the question to the fore to urge the convening of such Conferences as the Naini Tal Conference. I have reason to believe that this Conference has, with the approval of the Local Government, recommended a fairly comprehensive scheme which if accepted in its entirety will satisfy the reasonable requirements of the people of the United Provinces for some time to come and will constitute a marked step in advance of any thing that has yet been done in any province. After all it seems to me that the suggestion made by the Government of India in their letter to the Provincial Governments of date the 18th June 1888. *viz.*, that 'in order to expedite the development of technical education in India a survey of existing industries should be first undertaken, and secondly, a committee of educational experts and professional men should be formed in order to turn the knowlegne acquired by the survey to the best account,' still remains the best method of proceeding about the business. And this is in fact what the United Provinces Government have done. An officer was placed on special duty at the beginning of April to carry out an industrial survey and another officer at the beginning of June to prepare a scheme of technical education suitable for the Provinces to serve as a basis for discussion at the Conference, and the Conference itself was held in the latter part of August when both the reports and the scheme were ready. The composition of the Conference was thoroughly satisfactory as there were several eminent representatives of the Indian community on it besides 'educational experts and professional men.' In my opinion your Committee may profitably press a similar course of action on your Provincial Government.

7. An early reply is solicited.

I have the honour to be,
Sir,
You most obedient servant,
R. N. MUDHOLKAR,
General Secretary,
Indian Industrial Conference.

APPENDIX III.

(i) Plantain Cultivation in Bengal.

BY BABU ANNODA PRASAD GHOSE,

Commercial Intelligence Department, Calcutta.

Importance of Agriculture.

The importance of agriculture is evidenced by the fact that food and clothing, the essential requirements of man, are the products of agriculture. Even so many manufacturing arts and industries that feed so many thousands of people are inseparably related to agriculture, because agriculture yields materials with which numerous industries work. So, it is from agriculture that prosperity flows in full measure.

Having thus noticed the important part played by agriculture, I shall now focus my attention on one of the chief branches of agriculture which came to Bengal, of old, I mean plantain cultivation.

Plantain, a profitable crop.

Plantain is one of the most ancient of the cultivated crops of Bengal. It is abundantly grown in almost all its districts. It is the least troublesome, but at the same time, a very profitable crop, as every part of the plantain tree being useful, may be converted into cash. Apart from the great value of plantain as a highly nourishing vegetable (when the fruits are green) and ripe fruit, the crop is of great value as the source of good many useful products. The young leaves serve the purpose of plates and dishes to the poor natives; the flowers (known as "mocha") and the stem (when the fruits ripen) known as "thor" are table-vegetables; the dried leaves and sheaths yield ashes which, being rich in potash may be used either as a cleansing agent or as manure for the growth of leguminous crops; the roots when cleaned may be used as food in famine years; the fibres from the sheaths are a valuable commercial product from which cords and ropes are manufactured; besides these, flour more nutritious than wheat flour may be obtained from the fruits that are not altogether ripe.

Varieties.

The chief varieties that are commonly cultivated in Bengal and notably in Baidyabati, the centre of plantain cultivation in Bengal, are ;—Champa, Kanthali, Martaman, Kabuli, Kanai-banshi and Kanchi Kala. (These are all native names.)

Soil.

The soil for plantain cultivation should be clay loom. Such soil, if it contains a good deal of moisture, is best suited for the crop. Stagnant water is injurious to this crop, so the land chosen should be high and capable of easy draining. The site selected should be close to a tank or ditch.

Manures.

Plantain is often grown with manure. The manures used are cow-dung, tank-silt and decayed vegetable matter.

Plantation.

Thorough weathering of the soil is essential to plantain cultivation. The land selected should be ploughed up in October, while plantation should be deferred till the beginning of May following, when, after one ploughing and one cross-ploughing pits are made about one foot deep and 8 cubits apart. These should be watered and manured and then young suckers divested of all projected leaves should be planted. The intervening spots should be kept clean and should be ploughed once a year in November and tank-earth should be applied in the middle of April to the basis of the clumps. The suckers should be divested of all dried leaves. Care should be taken that no clump has more than 3 or 4 suckers and that young leaves are not cut away from them. As a rule, a plantain tree bears fruits in a year. As soon as a bunch has ripened, the tree should be cut down and its roots should be unearthed to avoid the birth and growth of a kind of insect-pest (commonly known as "Ajar-Poka") that would defoliate every sucker in the garden. A plantain garden properly taken care of can be preserved for years together (as for instance in Baidyabati) before it is superseded by a new garden.

Cost.

The expense per bigha may be calculated thus:—

	Rs.	A.	P.
Three ploughings	1	8	0
One cross-ploughing	0	8	0
121 suckers	4	4	0
Cost of planting suckers	1	4	0
Striping the suckers and weeding	2	8	0
Cost of applying silt	10	0	0
Harvesting	4	0	0
Rent	4	0	0
Total...	28	0	0
<i>Produce</i> —121 bunches from 121 suckers at 8 as.	60	8	0
<i>Net profit</i> per bigha neglecting all other use of the plant	32	8	0

{ A. P. GHOSH.

(ii) Agriculture and Industries In Jessore (Bengal.)

By BABU JOGINDRA NATH SAMADDAR, F. R. H. S.

Lecturer in History, P.M. College, Tangail.

1. The general condition of the agricultural industry is good. The industry consists in the cultivation of paddy, jute, mustard, *till*, linseed, coriander seed, barley, pepper, sugarcandy and several kinds of pulses. The success generally depends upon (a) rainfall at the proper season, *i.e.*, at and before tilling and during the growth of the plants (but as the land is rather low, too much rain is apt to injure the plants); (b) flood-water (any change in the average height is apt to destroy the plants). Last year, owing to excessive flood in the month of Bhadra (August-September) the rice-crop was destroyed. This year owing to want of rain, the rice-crop is far below the average, and mustard, pulse, and linseed have not been at all successful.

Agriculture is carried on in its primitive fashion, perhaps as it was carried on in the early centuries. There is rotation of crops, although there is much in this connexion left to be desired.

2. The whole district measures about 18 lakhs, and 72 thousand acres of which 11 lakhs, 37 thousand and 9 hundred acres have been brought under cultivation. Paddy is grown on land measuring about 8 lakhs, 28 thousand acres, jute in 41 thousand 3 hundred acres and other crops have been grown in the remaining portion. *Not a single acre is devoted to the cultivation of cotton.* Tobacco is cultivated on land measuring 21 thousand 5 acres. It thus appears that the greater portion of the culturable area has been brought under cultivation.

There is little left, however, for pasturage and generally the animals suffer on account of this. The gradual deterioration of the cattle is alarming. Agriculture without cattle means a serious and gloomy outlook.

3. The quality of the soil is generally loamy, sand-loamy and sandy. The quality is fair. In some places, the soil is sandy, where crops cannot be grown. At one place I found the first layer of sand is of 4 cubits.

4. The general condition of the landowning classes and specially of the middle classes with moderate means is gradually growing harder. Their income is not sufficient to meet their demands owing to famine-prices of food stuffs and rise in the wages of labour. That of the cultivators and of the working class is growing better day by day owing to the ex-

tension of jute-cultivation and rise in its price as also the general rise in the wages. Formerly a day labourer used to work for 3 annas per diem but now not only would he charge 6 to 8 annas, but labour is scarce. The rise in the price of food-stuffs has to do much with the rise in the wages of labour, but other causes also tend to its rise. For example, the Namasudra class used to work in this part of the country as menials and ordinary day labourers but they have for social reasons, ceased to serve as before.

5. Very few of the cultivators have proprietary interest in land ; they are tenants at will ; some are privileged tenants. Generally the cultivators hold the land in *Barga* (i.e., they cultivate the land themselves and share the produce with the proprietor of the soil.

The cultivators do not use much manure. Cowdung is generally used in orchards, while oil cakes are occasionally used.

6. A cooperative credit society has been established at Karandi in Sub division Magura by Babu Revatikanta Sircar, Pleader of Magura, who has advanced Rs. 250 to the society while the public-spirited Rajah of Naldanga has advanced Rs. 500 to a society at Naldanga. Steps are being taken to establish grain banks or *dharma-golas* but as there has not been a bumper harvest for the last three years, the scheme has not been given any practical shape. The Government advances money in times of scarcity. Considering the rate of interest which prevails here, cooperative credit societies are a desideratum. The general rate is two pice or 6 pies in the rupee per mensem but last year I came to know that 2 or 3 landlords advanced loans to their tenants at 1 anna to 2 annas per rupee per mensem while one landlord borrowed money from the Jessore Loan Company bearing interest at 6 per cent. *per annum* and advanced it to his tenants at 6 per cent. *per mensem*.

8. Not a single acre has been devoted to the cultivation of cotton but owing to the *Swadeshi* movement, middle class men are experimenting with American cotton seeds. It is doubtful what the result may be. Jessore, however, is famous for its fine *dholies*, *chadars*, etc. There are three chief centres for the production of these dhoties. In no place, however, are fine fabrics woven. The weavers depend on foreign fabrics for fine cloths while in some places 40's are woven. The three centres are Sidhipasha, Bagdanga and Rajarhant. In the first of these places there are 700 families of weavers. The condition of these weavers has been much improved owing to the impetus given by the *Swadeshi* movement. Mr. B. C. Sen, I.C.S., the late Magistrate and Collector

of Jessore in his Administration Report wrote that 'hand-loom is in full swing in some places and the *Swadeshi* movement has led many weavers to resume their former occupation in preference to working for wages'.

Raw jute is sent to Calcutta for exportation and disposal. The jute produced here is of inferior quality.

Gur is manufactured here in large quantity. Formerly Jessore was also a large sugar-producing district. Basundia, Kesabpur, Kotchandpur and Lohagra were the chief markets. Lohagora is now no longer a sugar producing place. Basundia is the market now for "*Dolo*" sugar. It is reddish but very sweet. Even fifteen years ago, imported sugar had no place here and the whole people depended on countrymade sugar. Imported sugar had well nigh driven countrymade sugar but the *Swadeshi* movement has again given an impetus as the people now take exception to sugar purified with bone. Java sugar, however, is in large demand. In the Administration Report referred to above, Mr. Sen wrote that 'the sugar industry at Cotechandpur which was in a moribund condition, also received an impetus from the *Swadeshi* movement. A factory by name 'Tarpur Sugar Works has been started, the sugar produced at which was exhibited at the last Calcutta Industrial Exhibition. The price of the locally made sugar is higher than that of Java and Basundia sugar.

Tobacco, as said before, is produced in this district and 'the new industry of curing tobacco started by Mr Macleod is in a *flourishing* condition' (Mr. Sen's report),

Raw hide is not tanned here but is sent to Calcutta thence to be exported. Bones of animals also share the same fate.

Only ordinary earthen pots are made here to serve the purpose of cooking and for household purposes.

Gold and silver are used for ordinary ornamental purposes. Iron is used in the manufacture of ordinary knives, scythes, hatchets, *i.e.*, only implements for household purposes.

Ordinary bamboos are used for furniture and plain khatias, etc., are made of wood. There is no fine workmanship.

9. There is a Loan Company with good assets at Jessore which lends money but it does not advance money for the support of industries.

The National School at Jessore, will have also, shortly, a technical branch added to it.

There is a branch of the Industrial Association (Calcutta) here but I do not think anything is being done by it.

APPENDIX IV.

JOINT STOCK COMPANIES.

*Number and Particulars of Joint Stock Companies registered in each Province in British India in the thirteen months ending the 31st October 1908.**

No.	Name of Company and Situation of its Registered Office.	Object.	Capital.
I.—BANKING AND INSURANCE.			
(a) BANKING AND LOAN.			
1	Papanaickanpalayampudur Ramavilasa Nidhi, Coimbatore, Madras.	Money lending (mutual)	Rs. 1,00,000
2	Agricultural Bank, Tinnevely, Madras	Banking	30,000
3	National Trading and Banking Co., Madras	Banking and trading	20,000
4	Nataraja Co., Trichinopoly, Madras	Money lending (mutual)	49,290
5	Dharapuram Janopakaram Nidhi, Coimbatore, Madras	Do.	1,00,000
6	Bhuvanagiri Hindu Sasvatha Nidhi, South Arcot, Madras	Do.	99,930
7	Fyzabad Bank, Sahebganj, U. P.	Banking	1,00,000
8	Coimbatore Sri Ranganathar Karuna Vilasa Nidhi, Coimbatore, Madras.	Money lending (mutual)	1,00,000
9	Nanjangud Sri Nanjandeswara Bank	Banking and trading	50,000
10	Puri Bank, Bengal	Banking and loan business	50,000
11	Hindustan Bank, Bengal	Do.	2,00,00,000
12	People's Industrial Bank, Allahabad	Do.	5,00,000
13	Sat Narayan Bank, Etah, U. P.	Do.	20,000

14	Doaba Bank, Amritsar, Punjab	...	...	Banking and carrying on general trade	...	5,00,000
15	Rajshahi Banking and Trading Corporation, Rajshahi, Bengal	...	...	Banking and dealing in coal, timber, etc.	...	50,000
16	Conjeevaram Ela Sasvatha Nidhi, Chingleput, Madras	...	...	Money lending	...	1,00,000
17	Sri vanjiam Bank, Tanjore, Madras	...	...	Banking ...	...	39,975
18	Railway United Service Bank, Meerut, U. P.	...	...	Banking, etc.	...	3,00,000
19	Punjab and Sind Bank, Amritsar, Punjab	...	...	Banking and general commission agency business	...	5,00,000
20	Colony Bank, Lyallpur, Punjab	...	...	Banking and loan	...	2,00,000
21	Anna Bank, Multan, Punjab	...	...	Banking business	...	1,25,000
22	Chenai Sri Ekambareswarar Sasvatha Nidhi, Madras	...	...	Money lending	...	2,10,000
23	Adamleakam Hindu Dhana Puripalana Upanidhi, Chingleput, Madras	...	...	Do.	...	82,000
24	Lukhmicole Rajbari Loan Office Company, Faridpur, Bengal	...	...	Lending money	...	50,000
25	Pubna Union Bank, Pubna, Bengal	...	...	Carrying on business of trade and money-lending	...	1,00,000
26	East India Bank, Cawnpore, U. P.	...	...	Banking, etc.	...	15,00,000
27	Royal Bank of India, Lahore, Punjab	...	...	Carrying on business of trade and banking	...	2,50,000
28	Bharat National Bank, Delhi, Punjab	...	...	Do	...	10,00,000
29	Rawalpindi Bank, Rawalpindi, Punjab	...	...	Banking, etc.	...	2,50,000
30	Palghat Bank, South Malabar, Madras	...	...	Do	...	20,000
31	Srinivasa Nidhi Co., Sidlaghatta, Mysore	...	...	Carrying on business of trading and banking	...	20,000
32	Bank of Northern India, Rawalpindi, Punjab	...	...	Banking and loan	...	5,00,000
33	Amba and Company, Guntur, Madras	...	...	Banking and trading	...	50,000
34	Vellore Mercantile Fund, Vellore, Madras	...	...	Money lending (mutual)	...	1,00,000
35	Rajanagar Loan and Trading Co., Eastern Bengal and Assam	...	...	Money lending and trading	...	20,000
36	Central Brotherhood Urban Bank of India and Ceylon, Simla	...	...	Money lending and encouraging industries and agriculture of India and Ceylon	...	1,00,000
37	Union Bank of Bijapore and Sholapore, Bombay	...	...	Banking business	...	1,00,000
38	Banka Banking, Trading and Agricultural Co., Bengal.	...	...	Banking and loan	...	20,000
39	Watajabad Banking Co., Chingleput, Madras	...	...	Do	...	30,000
Total, Banking and Loan ...						2,74,36,165

*Compiled from the *Indian Trade Journal*.

No.	Name of Company and Situation of its Registered Office.	Object.	Capital.
			Rs.
	(b) INSURANCE.		
40	British India Cooperative Insurance and Banking Co., Broach, Bombay.	Fire and Marine Insurance ...	5,00,000
41	Eastern Life Insurance, Bengal	Life Insurance ...	10,00,000
42	All India Banking and Insurance Co., Amritsar, Punjab	Banking and Insurance business ...	20,00,000
43	Indian Marine Insurance Co., Bombay.	Marine Insurance ...	10,00,000
44	Hindustan Assurance and Mutual Benefit Society, Gujranwala, Punjab.	Carrying on Life Insurance business, etc. ...	1,00,000
45	Swadeshi Life Assurance Co., Bombay	Life Assurance, etc. ...	10,00,000
46	Hindu Life Insurance Co., Bombay	Do ...	2,00,000
		Total Insurance ...	58,00,000
		Total, Banking and Insurance ...	3,32,36,165
	II.—TRADING		
	(a) NAVIGATION.		
47	East Bengal Mahajani Flotilla Co., Bengal.	Navigation business ...	15,00,000
48	Cooperative Navigation, Bengal	Do ...	25,00,000
49	Indo-Burma Steamship Company, Moulmein, Burma	Carrying on business of ship owners and carriers of goods, etc. ...	3,00,000
		Total, Navigation ...	43,00,000

(b) OTHERS.

50	Matheran Steam Light Tramway Co., Bombay	...	Construction and working a Railway or Tramway	...	10,00,000
51	Cooperative House, Bengal	...	General merchants	...	2,000
52	Prayag Cooperative Stores, Allahabad	...	To carry on business of supply association	...	20,000
53	W. N. Bhose & Co., Bengal	...	General merchants and commission agents	...	1,00,000
54	East India Cigarette Manufacturing Co., Bengal	...	Manufacturers of and dealers in tobacco, etc.	...	5,00,000
55	Annappurna Company, Allahabad	...	Trade in grains, etc.	...	20,000
56	Punjab Drugs and General Stores Company, Multan, Punjab	...	Manufacturing medicines, etc.	...	2,00,000
57	Industrial Workshop and Technical Institute, Multan, Punjab	...	Training up young students and Manufacturing articles, etc.	...	2,00,000
58	Fine Knitting Company, Ahmedabad	...	Hosiery manufacturers	...	1,20,000
59	Dayabhai and Kirpashanker & Co., Ahmedabad	...	Carrying on agency of a mill	...	4,800
60	Bombay Swadeshi Silk and Carpet Manufacturing Co., Bombay	...	Manufacturers of carpets, etc.	...	25,000
61	Bombay Safe Deposit Company, Bombay	...	Depositing valuable securities	...	3,00,000
62	Kadayanallur Sri Venkatesar Weaving Company, Tinnevely, Madras	...	Trading in cloths, silk, etc.	...	10,000
63	Reliance Manufacturing Co., Tanjore, Madras	...	General trade	...	20,000
64	Sri Minakshi Sundaresvara Swadesa Trading Hall, Tanjore, Madras	...	Do.	...	50,000
65	Kerala Trading Company, Calicut, Madras	...	Trading in timber, etc.	...	50,000
66	Maulvi Bazar Lakshmir Bhandar Samiti, Sylhet, Assam	...	Agriculture and trade, etc.	...	10,000
67	Ganesh Company, Bengal	...	General traders and commission agents	...	25,000
68	Timber Iron Workshop and Employment Securing Agency Company, Ludhiana	...	Carrying on business of building contractors and Procuring employment	...	2,50,000
69	Pandharpur Hand-loom Company, Pandharpur, Bombay	...	Traders of hand-loom cloth	...	20,000
70	Bombay-Bengal Swadeshi Trading Co., Bombay	...	Dealers in Indian manufactures and commission agents, etc.	...	1,50,000
71	Madras Stores Society	...	Carrying on general trade	...	20,000
72	Cooperative Syndicate, Bengal	...	Carrying on general trade	...	1,00,000
73	Baranagore Dairy Farm Company, Bengal	...	Keeping of Dairy Farm	...	5,000

No.	Name of Company and Situation of its Registered Office.	Object.	Capital.
			Rs.
74	Kashi Glass Manufacturing Co., Benares...	Manufacturing glass wares	2,00,000
75	Allahabad-Jubbulpore Coach Building Co., Allahabad	Coach building and cattle breeding	1,00,000
76	Agricultural Development Co., Allahabad	Farming and cattle breeding	30,000
77	Knitting and Milling Co., Fyzabad, U. P.	Selling hosiery goods, etc.	50,000
78	Mehta Brothers Match Manufacturing Co., Ahmedabad	Manufacturing matches	50,000
79	Central India Hosiery Co., Bombay	General traders	20,000
80	Madura Industrial Association, Madura	Promoting arts, industries and general trade	20,000
81	Sri Rani Vilasa Industrial Co., Tanjore	Weaving by hand-loom and trading	20,000
82	General Stores, Madras	Carrying on general trade	20,000
83	Khajura Bandhab Bhandar, Bengal	Carrying on the business of general traders	20,000
84	Lahore Foundry and Workshop, Lahore	Erecting foundries and workshops	1,00,000
85	Indian Tobacco Manufacturing Co., Lahore	Manufacturing tobacco	1,00,000
86	Cattle Breeding and Dairy Co., Sargodha, Punjab	Breeding cattle and carrying on the work of a dairy farm	1,50,000
87	Coimbatore Friends' Association, Coimbatore	Printing, etc.	1,00,000
88	Rajshahi Carrying Co., Rajshahi, Bengal	Trading in cars, carriages, etc.	20,000
89	Central Glass Work, Allahabad	Manufacturing glass, etc.	50,000
90	Yeola Swadeshi Match Manufacturing Co., Yeola District, Nasik, Bombay	Manufacturing matches	5,00,000
91	Vakil Trading Co., Amritsar, Punjab	Manufacturing stationery, etc.	1,00,000
92	Mysore Tannery, Bangalore, Mysore	Manufacturing leather goods	1,00,000
93	Bharat Stores, Bombay	Dealing in Indian articles	1,00,000
94	Lalbahai Tricumlal & Co., Ahmedabad	Carrying on Agency of mills	3,00,000
95	Madras National Emporium and Manufacturing Co., Madras	Reviving indigenous industries	6,000
96	Dacca Tannery Works, Dacca, E. B. & A.	Manufacturing leather goods	50,000

97	Behar Industrial and Agricultural Development Co., Bengal	...	Trading and farming	...	20,000
98	J. N. Singh & Co., Delhi	...	General trade and commission agency	...	1,00,000
99	Goa Coir and Oil Mill Co., Bombay	...	Manufacturing coir and brushes	...	2,50,000
100	Kumbakonam Native Industrial Co., Kumbakonam...	...	.....	...	20,000
101	Srirangam Hindu Union Stores, Trichinopoly Madras	...	Cooperative stores	...	20,000
102	Hindupur Cooperative Society, Anantapur	...	Do.	...	20,000
103	Indian Paper Marbling Co., Tanjore, Madras	...	Paper manufacturing and stationery	...	20,000
104	Utanka Agency Co., Bengal	...	Trading in tobacco, tea, coffee, oilman's stores, etc.	...	20,000
105	Commercial and Manufacturing Co., Gorakhpur, U. P.	...	General trade	...	1,00,000
106	Indian Nitrate and Alkali Co., Cawnpore	...	Dealing in saltpetre, salt, soda, etc.	...	80,000
107	Rajput Co., Amritsar, Punjab...	...	General trade and agency	...	50,000
108	Shellac Manufacturing Co., Bombay	...	Dealing in lac, etc.	...	1,00,000
109	British India Manufacturing Co., Bombay	...	Manufacturing combs, buttons, etc.	...	1,00,000
110	Indian Weaving Co., Madras	...	Trading in cotton, woollen and silk piece-goods	...	1,50,000
111	Tamluk Trading and Manufacturing Co., Bengal	...	goods	...	20,000
112	Bombay Agricultural Live Stock Co., Bombay	...	Trading and Manufacturing Indigenous goods	...	33.
113	Central Provinces Iron Works and General Trading Co., Nagpur.	...	Dealing in cattle, food for cattle, etc.	...	1,00,000
114	National Industrial and Trading Co., Godavari, Madras	...	Establishment and working of a mechanical and engineering workshops	...	1,00,000
115	Sri Bhuvanesvari Vilasa Industrial Co., Tanjore, Madras	...	Dealing in Swadeshi goods and commission agency	...	1,00,000
116	Swadeshi Vasthu Paripalam Sabha, Tinnevely, Madras	...	Encouragement of Indian manufactures and Industries	...	10,000
117	Rope Sole Shoes and Knitting Co., United Provinces	...	Trading in Swadeshi goods	...	20,000
118	Andhra Lakshmi Industrial Co., Kistna, Madras	...	Manufacture of rope sole shoes	...	20,000
119	R. M. Guzdar & Co., Allahabad	...	Dealing in paddy, skins and iron, and manufacturing candles, soaps, etc.	...	30,000
120	Punjab Bharat Bhandar, Ambala	...	General trading	...	2,00,000
121	Lalbahai Chenabhai & Co., Ahmedabad	...	Dealing in Indian goods	...	1,25,000
		...	Carrying on the agency of a mill	...	20,000
		...		...	4,000

No.	Name of Company and Situation of its Registered Office.	Object.	Capital.
			Rs.
122	Negapatam Indian Stores, Tanjore, Madras	Dealing in Indian goods	20,000
123	Mangalambica Metal Industries, Tanjore	Trading in metals and metal ware	50,000
124	Indian National Cooperative Society, Bombay	Cooperative stores, etc.	1,00,000
125	Bengal Industrial Company, Bengal	General merchants	50,000
126	Bengal Land Lirre Brick Co., Bengal	Manufacturing bricks, tiles, etc.	2,00,000
127	Punjab Tannery, Rawalpindi, Punjab	Manufacturing leather, etc.	5,00,000
128	N. K. S. National Union, Bombay	Tailors and outfitters	20,000
129	Sri Kamala Sarasvalthi Vilasa Industrial Co., Tanjore, Madras	Encouraging industries and trading	20,000
130	Sind Light Railways, Karachi, Bombay	Constructing and working a Railway or Tramway	7,50,000
131	Baroda Tramway Company, Bombay	Constructing and working a Railway or Tramway	5,00,000
132	Burma Cooperative Stores, Rangoon	Trading in Indian and Burmese goods	20,000
133	Mushin Trading Co., Gorakhpore, U. P.	General trade	1,00,000
134	Phoenix Carrying Co., Rawalpindi, Punjab	Carrying on of a passenger and goods Service and general agency business in vehicles	1,50,000
135	Punjab Leather Works Co., Multan, Punjab	Dealing in hides, etc.	2,00,000
136	Rewari General Trading Co., Rewari	General trade	1,00,000
137	Gujarat Swadeshi Stores Co., Ahmedabad	Dealing in Swadeshi articles	50,000
138	Weaving Co., Tanjore, Madras	Weaving cloth and trading	20,000
		Total, Others	99,76,800
		Total, Trading	1,42,76,800

III.—MILLS AND PRESSES.

(a) COTTON MILLS.

	(a) COTTON MILLS.	Spinning and weaving cotton, etc.,	7,00,000 16,00,000
139	Navab of Cambay Mills, Bombay	Do.	2,00,000
140	United Sind Spinning and Weaving Mills, Bombay	Do.	15,00,000
141	Gomtipur Spinning, Weaving and Manufacturing Co., Ahmedabad	Do.	15,00,000
142	Albion Spinning and Weaving Co., Bombay	Do.	12,00,000
143	Indore Malwa United Mills, Bombay	Do.	30,00,000
144	Godavari Industrial and Commercial Co., Godavari, Madras	Do.	50,000
145	Petit Nagpur Swadeshi Spinning, Weaving and Manufacturing Co., Bombay	Do.	1,20,000
146	Hindu Industrials, Tanjore, Madras	Do.	30,00,000
147	Vaso Minbai Mill, Ahmedabad	Do.	7,00,000
148	Vishnu Cotton Mill, Bombay	Do.	3,50,000
149	Sri Krishna Cotton Spinning and Weaving Co., Guntur, Madras	Do.	2,00,000
150	Surat Swadeshi Spinning and Weaving Co., Surat	Do.	10,000
151	Coimbatore Mill Mills Co., Coimbatore, Madras	Do.	2,00,000
152	Indian National Weaving Fraternity, Madras	Do.	2,00,000
153	Balsundre Mills, Moradabad, U. P.	Do.	1,25,000
154	Bande Mataram Cotton Mills Co., Bengal	Do.	12,00,000
155	Jam Manufacturing Co., Bombay	Do.	9,00,000
156	South Indian Mills Co., Tinnevely, Madras	Do.	50,000
157	Nellikuppam Swadeshi Spinning and Weaving Mills Co., South Arcot, Madras	Do.	1,50,000
158	Mohini Mills, Bengal	Do.	10,00,000
159	Sulakhmi Spinning, Weaving and Manufacturing Co., Hyderabad, Bombay	Do.	1,77,55,000
	Total, Cotton Mills		

No.	Name of Company and Situation of its Registered Office.	Object.	Capital.
	(b) OTHER MILLS AND PRESSES.		Rs.
160	India Flour Mills, Karachi, Bombay ...	Carrying on business of millers and grain dealers	6,00,000
161	Bhapindro Flour Mills Co., Ambala, Punjab	Manufacturing flour and extracting oil, etc.	5,00,000
162	Powell Wood Process Co., Bombay	Buying and selling timber	2,00,000
163	Indian Oil Mills Co., Guntur, Madras	Extracting oil from seeds	2,50,000
164	New Vaisya and Palimab Ginning and Cotton Press Co., Ferozabad, U. P.	Ginning, pressing and spinning cotton	1,00,000
165	Dera Factory Company, Dera Ghazi Khan, Punjab...	Ginning, pressing, etc., cotton, wool, hemp, etc.	1,00,000
166	Jagdish Mill Company, Moradabad, U. P.	Carrying on business of millers	50,000
167	Golden Ginning and Press Co., Lahore	Ginning and Pressing fabrics	2,50,000
168	Saraswati Oil Manufacturing Co., Ahmedabad	Manufacturing and selling oils, etc.	1,50,000
169	Anakapalce Building Co., Vizagapatam, Madras	Saving timber, etc.	25,000
170	Chaturvedi Mills Co., Ferozabad, U. P. ...	Manufacturing flour, ginning cotton, etc.	1,00,000
171	The Mooltan Spinning and Weaving Mills Co., Multan, Punjab...	Ginning and pressing cotton and jute, etc.	1,00,000
172	Mutyalpalli Oil Manufacturing Co., Kistna, Madras	Oil milling, etc.	50,000
173	Oudh Ginning and Pressing Mills Co., Hardoi, U. P.	Ginning and pressing cotton	2,50,000
174	Indian Industries, South Arcot, Madras	Establishing an oil mill	20,000
175	Katni Milling Co., Katni, C. P.	Flour mill business	2,00,000
176	Sri Laxmi Oil Mill Co., Akola, Berar	Oil mill business	1,50,000
177	Shri Narmada Cotton Seed Crushing Co., Bombay	Crushing cotton seed and other nuts	1,00,000
178	Punjab Flour Mills Co., Lahore	Carrying on business of flour milling, oil extracting, rice husking, etc.	2,50,000
179	Shri Nadij Husking and Grinding Mills Co., Ahmedabad, Bombay	Millers	1,00,000
180	Indian Dyeing and Printing Works, Bombay	Bleaching and dyers	12,00,000

181	South India and Mysore Manufacturing Co., Bombay, Govind Mills Co., Khanna, Punjab	Ginning and pressing cotton etc.	...	5,00,000
182	Amritsar Rice Mills Co., Amritsar, Punjab	Grinding wheat, etc.	...	30,000
		Rice milling, etc.	...	30,000
		Total, Other Mills and Presses	...	53,05,000
	IV. SUGAR MANUFACTURE.	Total, Mills and Presses	...	2,30,60,000
183	Swadeshi Sugar Manufacturing Co., Tanjore, Madras	Manufacturing sugar	...	20,000
184	Peshawar Sugar Manufacturing Co., Peshawar, N.-W. F. Province	Do	...	2,50,000
185	Prayag Sugar Company, Allahabad	Manufacturing sugar, gur and molasses	...	3,00,000
		Total, Sugar Manufacture	...	5,70,000
	V. MINING, QUARRYING AND PRINTING.			
186	United Coffee Supply Co., Coimbatore, Madras	Coffee curers and suppliers	...	1,50,000
187	Kombai Swadeshi Cardamom Planting Co., Madura, Madras	Planting cardamom, etc.	...	1,00,000
188	Sholapore Mining Co., Bombay	Mining mineral products	...	5,00,000
189	Indian Agricultural Association, Vizagapatam, Madras	Planting lands for growing food stuffs and trading	...	20,000
190	Ambari Tea Company, Bengal	Cultivation and manufacture of tea, etc.	...	1,25,000
191	Bengal Plumbago Syndicate, Bengal	Plumbago mining	...	50,000
		Total, Mining, Quarrying and Planting	...	9,55,000
	VI. OTHERS.			
192	Indian Institute of Sciences, Lahore	Giving instructions in occult sciences, medical and commercial subjects, etc.	...	20,000
193	Upper India Real Estate Co., Lahore	Dealing in immovable property	...	5,00,000
194	K. P. Ghoshia-property Improvement Association, Bengal	Acquisition and maintenance of lands, etc.	...	90,000
		Total, Others	...	6,10,000

*Abstract Table of Companies registered in the thirteen months ending 31st October 1908,
Compared with the Number registered in the twelve months ending 30th September 1907
and in the nine months ending 30th September 1906.*

Description.	NUMBERS.			CAPITAL.		
	Jan.-Sep. 1906.	Oct. 1906- Sep. 1907.	Oct. 1907- Oct. 1908.	Jan.-Sep. 1906.	Oct. 1906- Sep. 1907.	Oct. 1907- Oct. 1908.
Banking Companies ...	14	19	39	Rs. 167,00,000	Rs. 300,75,795	Rs. 2,74,36,165
Insurance Companies...	3	7	7	55,22,000	1,82,00,000	58,00,000
Navigation Companies	5	1	3	1,21,00,000	10,00,000	43,00,000
Other Trading Companies	46	58	89	70,53,200	41,79,000	99,76,800
Cotton Mills	22	11	21	1,80,52,000	64,25,000	1,77,55,000
Other Mills and Presses	16	26	23	47,86,750	49,62,850	53,05,000
Sugar Manufacturing Companies	2	2	3	5,00,000	5,00,000	5,70,000
Planting, Mining and Quarrying Companies	4	12	6	4,62,000	2,57,54,990	9,55,000
Other Companies	2	3	3	5,50,000	3,12,200	6,10,000
Total	114	139	194	6,57,23,950	9,14,09,835	6,37,07,965

Note.—The number of companies working exclusively in India with sterling capital and registered in the United Kingdom in the year 1907 was 28 and the grand total of their capital was £1,345,750 (Rs. 2,01,86,250).
The number of such companies registered in the eight months ending August 31, 1908 was 34, and their capital was £ 3,107,000 (Rs. 4,66,05,000).

INDEX.

A.

- Adinarayana Iyah, Rao Bahadur M., 442.
- Agricultural Banks, resolution on, 2-3, 417-422.
- Agricultural Banks* (Nicholson), 126.
- Agricultural Banks and Co-operative Societies in the Mysore State, 130-137 ; Sir Seshadri Iyer on the problem, 130 ; favourable conditions, 130-131 ; the growth of the Banks, 131-132 ; plague and the general depression in trade and business, 132 ; legislation for the introduction of the societies, 132-133 ; their development, 134-135 ; purposes for which loans are granted, 135-136 ; general success of the movement, 136-137.
- Agricultural Gazette* (Central Provinces), 175.
- Agricultural Improvements in the Central Provinces, 170-175 ; *Agricultural Journal of India*, quoted, 170-171 ; introduction of improvements in the Provinces, 171-172 ; the improvement of cattle, 172-173 ; improved implements, 173 ; scientific work at experiment stations, 173 ; improved methods of cultivation, 174-175 ; interest in farming, 175.
- Agricultural Indebtedness, 85-92 ; main points in connection with the question, 85-86 ; Sir George Clarke on the indebtedness of the agriculturists of the Western Presidency, 86 ; solution of the problem in Bombay and the Central Provinces, 87-90.
- Agricultural Journal of India*, quoted, 170-171.
- Agriculture, 24-27.
- Akbar, Emperor, 262.
- Akbarali, Mr. (Ludhiana), 291.
- All-India Weaving Competition, 12.
- Aloe Fibre Industry (The), 257-260 ; progress of the fibre trade, 257 ; reasons for not making use of the industry, 257 ; description of the plant, 257-258 ; the use of machinery, 258 ; scraping, 259 ; maceration, 259 ; conclusion, 260.
- Alvarez Cabral, 304.
- Andrew, Rev. Mr., 187.
- Annual Report, 56 ; its adoption, 56-60.
- Architecture, 83-84.
- Arkwright, Sir R., 306.
- Artistic Trades of the Punjab and their Development (The), 260-267 ; the art industries, 260-262 ; carpet weaving, 262-264 ; wood working, 264-266 ; metal embossing, 266-267 ; ivory carving, 267.
- Ashley, Prof. W. J., 390.
- Augusta, Princess, 291.

B.

- Baij Nath, Rai Bahadur Lala, on the Indian system of Banking and other Business, 143.
 Baines, J. A., 313.
 Bala Saheb (Anndh), 290.
 Bala Subramani Aiyar, A. S., 448.
 Banerjee, J. N., on the Aloe Fibre Industry, 257.
 Bastable, C. F., 317.
 Bessemer, 306.
 Bhagavat, Rao Bahadur D. V., on a Few Hints for the Consideration of those who may Intend to Establish New Oil Mills, 253.
 Bhise, Prof., 50.
 Birdwood, Sir George, 275.
 Bismarck, Otto Von, 308.
 Biswas, S. O., 282.
 Book-keeping, 152--154.
 Bose, J. O., 50.
 Bose, Sir B. K., 279.
 Boulton, M., 308.
 Breweries, 70.
 Bright, J., 308.
 Brindley, J., 306.
British India and its Trade (Tozer), 74.
 Brown, Percy, on the Artistic Trades of the Punjab and their Development, 260.
 Buchan, W. H., on Co-operative Credit Societies and the Problem of Organisation, 115.
 Bulloagh, 306.
 Business Education, 144--147.
 Bye-laws for a Rural Co-operative Credit Society, app I, 1--x.

C.

- Campbell, A. Y. G., 16.
 Capital, 318-319, 116-117, 50-51.
Capital, 248.
 Carlyle, Mr. on Capital, 138.
 Carpet Weaving, 262-263.
 Cartwright, E., 306.
 Castor seed, 222.
 Central Provinces and Berar Exhibition of 1908, 279-299; the origin of the Exhibition, 279-280; the General Purposes Committee, 280-281; efforts to awaken the interest of the outlying districts, 281-282; the Textile Section, 282-283; the Handloom Competition, 283-284; work of the Building Committee, 284-285; success of the Exhibition, 285-286; location of the Exhibition, 286-287; the Agricultural Section, 288-289;

- the Miscellaneous Section, 289-290; the Textile Section, 290-291; the Ladies' Section, 291; the loan collection, 291; the Himalayan Industries Company, 291-292; the Wood and Metal Section, 292-293; the Mining Section, 293; the Forest Section, 293-294; Exhibits by private firms, 294-296; the Amusement Section, 296; the programme of the Exhibition, 296-297; the Industrial Section, 297-299.
- Chamarajendra Wodayar, H. H. the late Maharajah, 180; on Agricultural Banks, 183.
- Charles V, 304.
- Charles II, 307.
- Chatterton, A., on Irrigation by Pumping, 176; mentioned, 12, 44, 387, 393 394.
- Chatterjee, A. C., 426.
- Chatterjee, Dr. P. C., 388.
- Chaudhuri, P. Ray, on Expression and Extraction of Oil, 205.
- Chaudhuri, Pandit Rambhaji Dutt, 3, 424.
- Chemical Engineering, 84.
- Chintamani, C. Y., 3, 6, 17, 55, 439, 442.
- Chit Associations, 127.
- Chitnavis, G. M., 279.
- Clarke, Sir George, on the indebtedness of the agriculturists of the Western Presidency, 86; mentioned, 400, 410.
- Clement, 306.
- Coal, 315.
- Coal Mines, 70-71.
- Cobden, R., 308.
- Commercial Education, 48.
- Commercial Education, resolution on, 2, 407-417.
- Colbert, J. B., 305.
- Columbus, Christopher, 303, 306.
- Co-operative Credit Societies and the Problem of Organisation, 115-125; the principle of co-operation, 115; the need of Agricultural India, 116; how capital can be raised, 117; organisation, 119-120; disadvantages of isolation, 120; organisation for the purpose of finance and control, 121-124; summing up, 124-125.
- Co-operative Credit Movement in India, xlv-xlvi; its progress and development, xlv-xlv; central, xlv; urban, xlv-xlvi; rural, xlv; assets and liabilities, *ib.*
- Copra, 223.
- Cort, H., 306.
- Cosmopolitanism, 306.
- Cotton Excise Duty, 34; resolution on, 3, 423-424.
- Cotton Industry, 32-34.
- Cotton Seed, 222.
- Cotton, Sir Arthur, 194.
- Craddock, R. H., 279-280.
- Credit Institutions in the Madras Presidency, 126-129; preliminary, 126;

- Nidhi, 126-127; Chit Associations, 127; Provident Funds, 127-128; Co-operative Credit Societies, 128-129; summing up, 129.
- Crompton, S., 306.
- Cromwell, O., 305.
- Crosthwaite, H. R., on an Introduction to Co-operative Credit, 92; mentioned, 387.
- Cumming, J. G., on the profit in the dyeing of yarn, 247; mentioned, 208.
- Curzon, Lord, 421.

D.

- Daga, Dewan Bahadur Kasturchand, 287.
- Dalvi, D. G., 2, 410.
- Date Sugar Industry of the 24-Parganas, app. III, xlii—xliv; introduction, xlii; soil, *ib*; plantation, xlii-xliii; tapping, xliii; gur making, *ib*; refining of gur into sugar, *ib*; cost per bigha, xliii-xliv: outturn, xliv.
- Deccan Agriculturists' Relief Act, 28.
- Delegates to the Fourth Indian Industrial Conference, List of, app. IV., xlii—xlix,
- Delitzsch, H. S., 96.
- Departments of Industry, resolution on, 1, 388—395.
- Desai, Dewan Bahadur, A.S., on Railway Rates on Goods, 425; mentioned, 3, 18, 19, 56, 57, 60, 427.
- Desai, Rao Bahadur K, G, 3, 418.
- Desikachari, Sir V., 180, 418.
- Devine, Henry, on Co-operative Credit, 95; on self-help, 108; mentioned, 114.
- Dikshit, H. S., 3, 486.
- Directory of Indian Goods and Industries*, 56.
- Directory of Technical Institutions*, 56.
- Duff, Sir Grant., 402.
- Dutt, R. C., 17, 19, 313.
- Dyeing Industry, 244-245.
- Dyestuffs, 251-252.

E.

- Economic History of British India* (Dutt), 313.
- Education of Engineers in the Bombay Presidency, 79—81; the position of a Civil Engineer in India compared with that of his confrere in England, 79-80; one weak spot in the system of education in the Bombay Presidency, 80-81; the profession of Engineering and public support, 81-82; public bodies requiring the services of trained Engineers, 82; provision for training men for the work, 82-83; Mining Engineering, 88; architecture, 83-84; Chemical Engineering, 84; chief requirements of the situation, *ib*.
- Education of persons who intend to make Scientific Investigation to take part in Industrial Development, 75—79; two classes of men in India, 75; technical education and industrial training, 75; education in

general, 75-76; the Western and the Eastern student, 76-77; reasons for the backwardness of the Indian student, 77; remarks on industrial training, 78-79.

Election of the President, 16-18.

Elliot, Sir Charles, on our agricultural population, 23.

Essays on Indian Economics (Ranade), 61.

Exhibitions, 35, 54-55.

Expansion of England (Sir J. Seeley), 303.

Export and Import Trade, 45.

Expression and Extraction of Oil, 205-243; the business prospects, 205-211; the expression of oil, 211-232; the Ghani, 212; improvement on the old mill, 216; linseed, 220-222; cotton seed, 222; castor seed, 223; copra, *ib*; presses, 226; pumps, 226; the extraction of oil, 232-243; conclusion, 243-244.

F.

Few Hints for the Consideration of those who may Intend to Establish New Oil Mills, 253-257; fall in the number of oil mills, 253; the speculative nature of the business, 253-255; quantity of seed consumed by an oil mill in one year, 255; causes of failures, 255-256.

Fisher, Jesse, 233.

Fly Shuttle Looms, their superiority over the pit-loom, 12-13.

Free Trade, 316.

G.

Gaekwar, H. H. the Maharajah, on minor industries, 10-11; on cottage industries, 271-273; on the training of the eye and of the hand, 277; mentioned, 18, 19.

Gajjar, T. K., 60.

General Education, 29, 75-76.

Ghay, J., 284.

Glassware, 72-73.

Goenka, Baij Nath, 208.

Gold Mining, 71.

Gopal Menon, C., on the Industrial Ascendancy of the Nations, 300.

Gourlay, W., 116.

Government and Industrial Development, 162-169; condition of the ryots and artisan classes, 162-163; main directions in which endeavour should be made for promoting the development of industries, 163; recommendations of the Ootacamund Conference, 164-165; chief objections to Government policy, 165; remarks of the Madras Government on the same, 166; restrictions laid down by the Conference, 166-167; formation of a bureau of industrial information and local industrial committees, 167; education in mechanical arts and the application of scientific knowledge to arts and industries, 168-169.

Government Stores, 52-53.

Govinda Gramini, Tilla, 182.

Govindaswami Naidu, 187.

Grigg, H. B., 402.
Gurumurthy Chetty, Bala, 182

H.

Hadaway, W. S., on industries for women, 273.
Hadi, S. M., 41, 289.
Handloom Industry, 12-13.
Handloom Weaving, 34-36.
Hargreaves, J., 33, 306.
Havell, E. B., on manual and mechanical labour, 271; on Boole's system, 277-278.
Heaton, Prof. B., 403.
Hewett, Sir John, 396.
Hides and Skins, 314-315.
Hindu (The), 15.
Hoffmann, Louis, 234, 237.
Home Industries, 273-276.
Home Industries for Indian Women, 268-279; the reforms in the administration of the country, 268; the condition of the people, 268-269; the establishment of large industries, 269-270; Mr. E. B. Havell on manual and mechanical labour, 271; H. H. the Gaekwar on the multiplication of hand power, 271-272; the home industries, 273-276; the education of our girls, 277; Mr. Havell on Boole's system, 277-278.
Hunter, Sir William, on the poverty of the people, 23.
Huskisson, W., 308.

I.

Ideals, the influence of, 20-21.
Ilbert, Sir C., 416.
Improvements in Agriculture in Southern India, 319-386; importance of agriculture, 319-320; its progress in India, 320-321; the science of agriculture, 321-322; tillage, 322-323; different kinds of ploughs, 323-326; harrowing, 326-328; the objects of cultivation, 328; the utility of the atmosphere, 330; the effect of good tillage, *ib.*; the necessity of moisture for the growth of crops, 330-333; the supply of humus to the soil, 333-334; green manuring, 334-339; manuring in general, 339-347; sowing 347-350 paddy; crop, 350-358; other food crops, 358-360; the improvement of crops, 360-362; the fibre crops, 362-364; fodder crops, 364-366; rotation of crops, 366-368; irrigation of crops 368-370; the importance of fallow in farm management, 370-372; the improvement of soils, 372-374; pests, 374-376; drainage, 375-376; agriculture in Japan and America, 376-378; economy in the management of farms, 378-379; education of the ryot in improved cultural methods, 379-386.
Indebtedness of the Ryot, 28-29.
Indian Patriot, The, 447.
Indian Shorthand, 143-144.

Indian System of Banking and other Business, 148—158 ; the Indian Short-hand, 149 ; business education, 144—147 ; the system of doing business ; 147—151 ; money lending, 151-152 ; the Indian broker, 152 ; book-keeping, 152—154 ; accuracy of accounts, 154-155 ; suttas, 155-156 ; trades associations, 156—158.

Indian Trade Journal, The, 234.

Industrial Arts, 260—262.

Industrial Ascendency of the Nations (The), 300—319, industry and commerce, 300-301 ; the various stages of society, 301-302 ; trade routes and commerce, 302-305 ; the theory of mercantilism, 305-308 ; the scientific inventions, 306-307 ; the economic policy of England, 307-308 ; the Franco-Prussian war, 308 ; German shipping, 309 ; trusts and combinations in the United States, 309-310 ; the industrial development of Japan, 310-311 ; why Indian industries are crippled, 312—314 ; the textile industry, 314 ; export in hides and skins, 314-315 ; the jute industry, 315 ; the coal resources, 315 ; iron and steel industry, 315 ; oil and sugar, 315-316 ; Free Trade and Protection, 316-317 ; the village communities, 317-318 ; capital, 318-319.

Industrial Training, 75.

Industrial Situation, 23-24.

Industry and Commerce, 300-301.

International Co-operative Bibliography, 114.

Introduction to Co operative Credit, 93—115 ; Ruskin on true economy, 93 ; co-operative credit, *ib.* ; encouragement to industry, 93-94 ; standard of comfort proportionate to the degree of industry, 94 ; prosperity of a country depends on the industry of its people, 94-95 ; why the Government favours the co-operative movement, 95 ; the effect and influence of co-operative credit, 95-96 ; the leading principle of co-operative credit, 96 ; Herr Raiffeisen and Schulze Deluzsch-96 ; middle course between the ideals, 96-97 ; system of *takavi* advances, 98 ; summary of principles underlying a typical rural society, 99 ; grants of loans, 99-100 ; steps to be taken to start a rural society, 101-104 ; how these societies are financed, 104-105 ; the functions of a Bank, 105-106 : the arguments for State aid, 108 ; lines on which local Central Banks may be organised, 112—114.

Iron and Steel Mines, 71.

Iron and Steel Industry, 315.

Irrigation, 27.

Irrigation by Pumping, 176—201 ; obstacles to the improvement of the economic situation, 176—178 ; mechanical means for lifting water, 178 ; intensive cultivation, 179-180 ; installation of a 7½ H. P. engine and 4" pump at Kalinjikuppam, 180—181 ; installation of a 5 B.H.P. engine and 3" pump at Panamkuppam, 181-182 ; installation of a 9 B.H.P. engine and 4" pump at Nellikuppam, 182 ; installation of a 7½ B.H.P. engine and 4" pump at Punjerikuppam, 182-183 ; two installations, one a 9 B H.P. engine and 4" pump and the other a

9½ B.H.P. and 4" pump at Cuddalore, 183-184; installation of a 9 B.H.P. engine and 6" pump at Panampet, 184-186; installation of a 7½ H.P. engine and 4" pump at Arukilavadi, 186-187; installation of a 12, H.P. engine and 5" pump at Natham, 187; installation of a 3½ H.P. engine and 3" pump at Melrosapuram, 187-188; installation of a 6½ H.P. engine used and a 4" pump at the Agricultural College, Saidapet, 188-189; installation of a 6½ H. P. engine and a 4" pump at Surapet, 189; installation of a 5 H. P. engine and a 3" pump at Tondiarpet, 189-190; installation of a 7½ H..P. engine and a 4" pump at Tirukkarugavur, 190; table showing the actual cost of supplying each aere of land with water, 191; generalisations based on the above data, 195-200; interest in the mechanical methods of doing work, 201,

J.

Jehangir, Sir C., 82.

Joshi, G. V., 282.

Journal of the Society of Dyers and Colourists, 250.

Jute Industry, 68-69, 315.

K.

Kale, V. G., on Twenty-five years' Survey of Indian Industries, 61; mentioned, 437.

Kay, W., 306.

Kelkar, R. M., 280.

Kerosene Oil Industry, 71-72.

Kiralfy, Imré, 285.

Knight, J.B., on Remarks about the Practice of Using Cow-dung as Fuel, 203.

Kollengode, Rajah of, on the election of the President, 16-17.

Krishna, Sir Bhalchandra, on the election of the President, 17.

Krishnaswami Rao, Dewan Bahadur, 60.

L.

Lakshminarasu Naidu, P., 447.

Land Revenue, its remissions and suspensions, 31-32.

Lawley, Sir Arthur, 7, 9, 16, 448.

Lees-Smith, Prof., 48, 409, 412.

Leibig, Baron. on Agriculture, 319.

Lely, Sir F., 426.

Lift Irrigation, 27-28.

Linseed, 220-222.

Loans Acts, 29.

Loans, Land Bank, 29-30.

Louis xiv., 305.

Low, O. E., on the Central Provinces and Berar Exhibition of 1908, 279.

M.

Macaulay, Lord, on adversity and prosperity, 93.

Madhava Rao, V. P., on the Co-operative movement, 133.

- Madras College of Engineering, 2.
 Magellan, F de, 306.
 Mahajani, R. V., 1, 394.
 Malaviya, Madan Mohan, on Technical and Industrial Education, 395,
 mentioned, 2, 399.
 Manures, 43-44.
 Marco Polo, 303.
 Marshall, Prof. A., 34.
 Mechanical Engineering, 79.
 Mercantilism, 305-306.
 Metal Embossing, 266-267.
 Mill, J. S., 34.
 Mill Industry, 11.
 Mines and Minerals, 36-38.
 Mining Engineering, 83.
 Mining, Weaving and Sugar Industries, resolution on, 3, 428-438.
 Minor Industries, 44.
 Minto, Lady, 291.
 Minto Lord, 7.
 Mitter, S. C., 388.
 Mollison, J. W., 320.
 Money Lending, 151-152.
 Morley, Lord, 7, 423, 443.
 Mndholkar, Rao Bahadur R. N., 3, 4, 6, 16, 17, 18, 56, 279, 280, 439, 442,
 443, 444.
 Mukerji, N. G., on the objects of cultivation, 328.
 Muniappa Gramani, 189.

N.

- Nanjunda Rao, Dr. M. C., on Home Industries for Indian Women, 268.
 Narayanaswami Aiyar, T. S., 190.
 Nicholson, Sir F., 126.
 Nidhi, 126-127.
 Nullard, A., 275.

O.

- Office-bearers and Funds for 1909, resolution on, 3-4, 439.
 Oils and Oil-seeds, 42-43.
 Oil seeds, 315.
 Ootacamund Conference, recommendations of, 164-165.
 Opening for Small Dye Works in Bengal (An), 244-253; prospects of the
 dyeing industry, 243-245; imports of dyed and printed goods into
 Calcutta, 245-246; increase in value after dyeing, 247-248; annual
 income and expenditure, 249-251; dycstuffs, 251-252; suggestive
 remarks on the question, 252-253.

P.

- Pandit, Rao Bahadur V. R., 280, 285.
 Pandithar, A., 359.

9½ B.H.P. and 4" pump at Cuddalore, 183-184; installation of a 9 B.H.P. engine and 6" pump at Panampet, 184-186; installation of a 7½ H.P. engine and 4" pump at Arukilavadi, 186-187; installation of a 12, H.P. engine and 5" pump at Natham, 187; installation of a 3½ H.P. engine and 3" pump at Melrosapuram, 187-188; installation of a 6½ H.P. engine used and a 4" pump at the Agricultural College, Saidapet, 188-189; installation of a 6½ H. P. engine and a 4" pump at Surapet, 189; installation of a 5 H. P. engine and a 3" pump at Tondiarpet, 189-190; installation of a 7½ H..P. engine and a 4" pump at Tirukkarugavur, 190; table showing the actual cost of supplying each acre of land with water, 191; generalisations based on the above data, 195-200; interest in the mechanical methods of doing work, 201,

J.

Jehangir, Sir C., 82.

Joshi, G. V., 282.

Journal of the Society of Dyers and Colourists, 250.

Jute Industry, 68-69, 315.

K.

Kale, V. G., on Twenty-five years' Survey of Indian Industries, 61; mentioned, 437.

Kay, W., 306.

Kelkar, R. M., 280.

Kerosene Oil Industry, 71-72.

Kiralfy, Imré, 285.

Knight, J. B., on Remarks about the Practice of Using Cow-dung as Fuel, 203.

Kollengode, Rajah of, on the election of the President, 16-17.

Krishna, Sir Bhalchandra, on the election of the President, 17.

Krishnaswami Rao, Dewan Bahadur, 60.

L.

Lakshminarasu Naidu, P., 447.

Land Revenue, its remissions and suspensions, 31-32.

Lawley, Sir Arthur, 7, 9, 16, 448.

Lees-Smith, Prof., 48, 409, 412.

Leibig, Baron, on Agriculture, 319.

Lely, Sir F., 426.

Lift Irrigation, 27-28.

Linseed, 220-222.

Loans Acts, 29.

Loans, Land Bank, 29-30.

Louis xiv., 305.

Low, O. E., on the Central Provinces and Berar Exhibition of 1908, 279.

M.

Macaulay, Lord, on adversity and prosperity, 93.

Madhava Rao, V. P., on the Co-operative movement, 133.

- Madras College of Engineering, 2.
 Magellan, F de, 306.
 Mahajani, R. V., 1, 394.
 Malaviya, Madan Mohan, on Technical and Industrial Education, 395, mentioned, 2, 399.
 Manures, 43-44.
 Marco Polo, 303.
 Marshall, Prof. A., 34.
 Mechanical Engineering, 79.
 Mercantilism, 305-306.
 Metal Embossing, 266-267.
 Mill, J. S., 34.
 Mill Industry, 11.
 Mines and Minerals, 36-38.
 Mining Engineering, 83.
 Mining, Weaving and Sugar Industries, resolution on, 3, 428-438.
 Minor Industries, 44.
 Minto, Lady, 291.
 Minto Lord, 7.
 Mitter, S. C., 388.
 Mollison, J. W., 320.
 Money Lending, 151-152.
 Morley, Lord, 7, 423, 443.
 Mndholkar, Rao Bahadur R. N., 3, 4, 6, 16, 17, 18, 56, 279, 280, 439, 442, 443, 444.
 Mukerji, N. G., on the objects of cultivation, 328.
 Muniappa Gramani, 189.

N.

- Nanjunda Rao, Dr. M. C., on Home Industries for Indian Women, 268.
 Narayanaswami Aiyar, T. S., 190.
 Nicholson, Sir F., 126.
 Nidhi, 126-127.
 Nullard, A., 275.

O.

- Office-bearers and Funds for 1909, resolution on, 3-4, 439.
 Oils and Oil-seeds, 42-43.
 Oil seeds, 315.
 Ootacamund Conference, recommendations of, 164-165.
 Opening for Small Dye Works in Bengal (An), 244-253; prospects of the dyeing industry, 243-245; imports of dyed and printed goods into Calcutta, 245-246; increase in value after dyeing, 247-248; annual income and expenditure, 249-251; dyestuffs, 251-252; suggestive remarks on the question, 252-253.

P.

- Pandit, Rao Bahadur V. R., 280, 285.
 Pandithar, A., 359.

- Panduranga Mudaliar, 183.
 Paper Mills, 70.
 Parekh, G. K., 2, 399.
 Pattabhirama Rao, N., on the Government and Industrial Development, 162; mentioned, 447.
 Peel, Sir R., 308.
 Phatak, Krishna Rao, 280.
 Phillip II, 304.
 Poona College of Science, 1.
 Presidential Address (The), 19-56; the influence of ideals, 20-21; the Swadeshi gospel, 21-23; our industrial situation, 23-24; agriculture, 24-27; irrigation, 27; lift irrigation, 27-28; ryots indebtedness, 28-29; general education, 29; loans—land bank, 29-30; settlement operations, 30-31; suspensions and remissions of land revenue, 31-32; cotton manufacturing industry, 32-34; the Cotton Excise Duty, 34; handloom weaving, 34-36; mines and minerals, 36-40; sugar, 40-42; oils and oil seeds, 42-43; manures, 43-44; tanning and leather dressing, 44; other industries, *ib*; the export and import trade, 45; our work, 45-46; scientific and technical education, 46-50; capital, 50-51; railway rates, 51-52; unification of weights and measures, 52; Government stores, 52-53; plan of operations and an advisory board, 53-54; exhibitions, 54-55; conclusion, 55-56.
 Problem of the Indigenous Workman, 158-162; the condition of workmen in the factories and free labourers, 158-160; Schools of Art, 160; suggestions for improving the condition of workmen, 160-162.
 Protection, 316.
 Protective Tariffs, 9-10.
 Provident Funds, 127-128.
 Punjab Land Alienation Act, 28.

R.

- Ragoonath Rao, Dewan Bahadur, his advice to our leaders, 14; mentioned, 13.
 Raiffeisen, Herr., the pioneer of modern personal co-operative credit, 96-99
 Railway Rates, 51-52.
 Railway Rates on Goods, resolution on, 3; 425-427.
 Rajarathnam Mudaliar, Dewan Bahadur, his speech as Chairman of the Committee, 5-16; the Conference, a common platform, 5; industrial activity in the country, 6; proposals for carrying out a comprehensive scheme of technical education, 6-7; the action taken by the Madras Government, 7-9; the more important recommendations of the Ootacamund Conference, 8; disappointing feature of the Government orders, 9; protective tariffs, 9-10; H. H. the Maharajah Gekwar quoted, 10-11; scope for the improvement of our textile industry, 11; necessity for increasing the number of our mills, 11-12; the hand loom industry, 12-13; its prospects in the Tanjore District, 13-14; Mr. V. K. Ramanujachariar's Report, 14-16; mentioned, 15, 447.

- Ramachendra Rao, R., on Credits Institutions in the Madras Presidency, 126; mentioned, 387, 418.
- Ramakrishna Iyer, M. R., on Improvements in Agriculture in Southern India, 319—386; mentioned, 387.
- Ramanuja Chariar, V. K., on the fly-shuttle loom, 13, 14—16; mentioned, 3, 421.
- Ranadc, M. G., on the revival and encouragement of indigenous industries, 61; on the classification of raw and manufactured goods, 63; mentioned, 17, 62, 65, 66, 67.
- Rangachariar, T., 2, 400.
- Ranjit Singh, Maharajah, 267.
- Ravi Varma, 290.
- Recommendations of the Octacamund Conference, 8.
- Resolutions of the First, Second and Third Industrial Conference, xlix—lv.
- Resolutions of the Fourth Indian Industrial Conference, 1—4; Departments of Industry, 1; Technical and Industrial Education, 1-2; Commercial Education, 2; Agricultural Banks, 1—3; Cotton Excise Duty, 3; Railway Rates on Goods, 3; Mining, Weaving and Sugar Industries, 3; Office-bearers and funds for next year, 3-4.
- Ripon, Lord, 31.
- Roscoe, Sir H., 76.
- Rural Society, definition of, 98.
- Ruskin, J., on true economy, 93.
- Samaldas Lalubhai, on Agricultural Indebtedness, 85; on a scheme of Central Financing Society, 137; on Agricultural Banks, 417-418; mentioned, 3, 138, 387.
- Sampson, H. E., 327.
- Scheme of a Central Financing Society, 137—143; the need of a central financing agency, 137-138; Mr. Carlyle on capital, 138; principal features of the scheme, 139-140; the essential feature of the scheme, 140; Sir Vithaldas on the duty of the Government to help the agriculturist, 141-142.
- Scientific and Technical Education, 46.
- Seeley, Sir J., 303.
- Scudamore, Major M. V., on the Education of Engineers in the Bombay Presidency, 79.
- Seshadri Iyer, Sir K., on Agricultural Banks, 130, 131.
- Settlement Operations, 30-31.
- Shama Rao, M., on Agricultural Banks and Co-operative Societies in the Mysore State, 130; mentioned, 387.
- Shukul, B. D., 113, 114.
- Sibpur Engineering College, 2.
- Smeaton, J., 306.
- Smith, Adam, 305.
- Some remarks about the practice of using cow-dung as fuel, 203—205; the loss in burning cow-dung, 204; its value, *ib.*
- Srinivasa Gounden, 181.

- Srinivasa Rao, Rao Babadur G., 1, 392.
 Stephenson, G., 306.
 Subbarao Pantulu, N., 4, 439.
 Subramania Iyer, G., 3, 482, 436, 437, 438.
 Subramani Iyer, K., on Commercial Education, 407 ; mentioned, 2.
 Subramania Aiyar, V., 184.
 Sugar, 40—42, 72, 315-316.
 Suri, Lala D. D., 2, 403.
 Swadeshi Movement, 6, 21—23, 73-74.

T.

- Tata, J.N., 37, 391.
 Tanning and Leather Dressing, 44.
 Tawker, Gopinatha, 189.
 Tea Plantations, 69-70.
 Technical Education, 75.
 Technical and Industrial Education, resolution on, 1-2, 395—407.
 Tellery, A., on the Problem of the Indigenous Workman, 158.
 Textile Industry, 11, 67-68, 814.
 Thackersey, Sir Vithaldas D., on a scheme of a Central Financing Society
 137 ; on Mining, Weaving and Sugar Industries, 428 ; mentioned, 3, 19,
 57, 60, 137, 138, 141, 387, 407, 418, 435, 436, 437, 438, 443, 445.
 Theagaroya Chettiar, P., 12.
 Thurston, Dr., 276.
Times of India (The), 138.
 Todar Mall, Raja, 143.
 Tozer, H. J., quoted, 74.
 Trade Routes, 302.
 Trades Associations, 156—158.
 Travers, Dr. Morris W., on the Education of Persons who intend to make
 Scientific Investigation to take part in Industrial Development, 75.
 Trivedi, U. K., on the Cotton Excise Duty, 423 ; mentioned, 3.
 Twenty-five Years' Survey of Indian Industries, 61—74 ; the process of
 ruralisation and rustication, 61 ; five features of the transitional stage,
 63—66 ; imports and exports during the last 14 years, 62—67 ; distinc-
 tion between raw materials and manufactured goods, 63 ; the textile
 industry, 67-68 ; the jute industry, 68-69 ; woollen mills, 69 ; tea
 plantations, 69-70 ; paper mills, 70 ; breweries, 70 ; coal mines, 70—71 ;
 gold mining, 71 ; iron and steel mines, 71 ; kerosene oil industry, 71
 72 ; the sugar industry, 72 ; glassware, 72-73 ; the progress of indus-
 trial development, 73-74.

V.

- Varma, Ganga Prasad, 4, 442.
 Vasco da Gama, 303, 304.
 Venkatesubba Reddiar, A., 186.

Vesey, Captain the Honourable Mr., 16.

Victoria Jubilee Institute, app. II, xi-xiii; science teaching, xii; art teaching, xii; mechanical industries, xii; suitable subjects of instruction, xii; the aim and object to be desired in the new institution, xiii; Government recognition, xiii; special industrial schools, xiii; appeal for co-operation, xiii; jubilee celebration, xiii-xiv; jubilee memorial, xiv; Government grant, xiv; Municipal grant, xiv; mill owner's donations, xiv; Board of Management, xiv-xv; Dr. Walmsley's rough scheme, xv; Mr. Wadia elected Honorary Secretary, xv; transfer of the R.J. Fund, Sir J.J.M. Fund, and Ripon W Fund, xv; representative of the Sir J. J. Memorial, xv; the Ripon Memorial Committee, xv; question of site and Sir Dinshaw's gift, xv-xvi; legal position of the Board, xvi; Society registered, xvi; object of the Society, xvi; principal provisions of the rules and regulations, xvi; constitution, xvi-xvii; relation with Government, xvii; appointment of Principal, xvii; science classes, xviii; admission, xviii; fees, xviii; free studentships, xviii; Mr. Wadia's additions to Mr. Phythisen's scheme, xviii; remodelling of buildings, xviii-xix; head of the Textile School appointed, xix; classes opened, xix; formal opening, xix; evening classes opened, xix; day classes routine of work, xx; scheme of examinations, xx; diplomas, xxi; first practical examinations, xxi; Boiler Act Examinations, xxi-xxii; collection of trade articles and defects collection, xxiii; library, xxiii; longer hours, xxiii; higher preliminary education, xxiii-xxiv; distribution of awards, xxiv-xxv; metal working and enamelling, xxv-xxvi; death of Mr. Phythian, xxvi; Committee's recommendations, xxvi-xxvii; City and Guild's London Examinations, xxvii-xxviii; plumbing and sanitary engineering, xxviii; enamelling, Boiler Act, xxviii; its position at Mr. Wadia's death, xxviii-xxix; Mr. Moos as Honorary Secretary, xxix-xxx; need of re-organisation, xxx; electrical engineering introduced, xxx; improvement of the mechanical engineering department, xxxi; Entrance Examination, xxxi-xxxii; Educational Conferences, xxxii; public criticism, xxxii-xxxiv; developments considered, xxxiv; Mr. Monie's death, xxxiv; Mr. Dawson as Principal, xxxiv-xxxv; reforms in 1905, xxxv; central power station, xxxv; special donation, xxxv; residential quarters, xxxv-xxxvi; enamelling improved, xxxvi; Dr. Mackenzie, the new Principal, xxxvi-xxxvii; chemistry section, xxxvii; Dr. Mackenzie's resignation, xxxvii; Mr. Dawson again as Principal, xxxvii; developments from 1905-1908, xxxviii; new students quarters, xxxviii; central power station, xxxviii-xxxix; pattern making shop, xl; increase of staff, xl; length of courses of instruction, xl-xli; twenty years' review, xli-xlii.

Vinayak, Rao Bahadur D., 8, 427.

Völcker, Dr., on the maintenance of fertility, 373; on the cheapening of fuel, 384; on the Indian Ryot, 320; mentioned 25.

W.

Waeha, D. E , on Departments of Industry, 388, 407, 410 ; mentioned, 1.

Watson, E. R., on an Opening for Small Dye Works in Bengal, 244.

Watt, J., 306.

Weights and Measures, their unification, 52.

Wilson, H.H., on the British manufacturer, 32-33.

Weed Working, 264—266.

Wolverhampton, Lord, 423.

Woollen Mills, 69.

INDEX TO THE REPORT ON THE WORK OF THE INDIAN INDUSTRIAL CONFERENCE.

A.

- Abstract Table of Companies, 88.
- Adambakam Hindu Dhana Puipalana Upanidhi, Chingleput, 79.
- Agricultural Association (Coimbatore), 54.
- Agricultural Bank (Tinnevely), 78.
- Agricultural College (Coimbatore), 25.
- Agricultural Demonstration and Exhibition (Bareilly), 32.
- Agricultural Development Co., Allahabad, 82.
- Agriculture and Industries in Jessore, 75—77.
- Ahmedabad New Cotton Mills Co., 44.
- Ahmedabad New Edward Manufacturing Co., 44.
- Ahmedabad Spinning and Manufacturing Mill, 44.
- Akola and Mid-India Spinning, Weaving and Manufacturing Co., Ltd., 59.
- Albion Spinning and Weaving Co., Bombay, 55.
- Allahabad-Jubbulpore Coach Building Co., Allahabad, 82.
- All-India Banking and Insurance Co., Amritsar, 80.
- All-India Weaving Competition (Madras), 3, 4, 25, 37, 51.
- Amba and Company, Guntur, 79.
- Ambari Tea Company, Bengal, 87.
- Amraoti Technical Institute, 60.
- Amritsar Rice Mills Co., Amritsar, Punjab, 87.
- Anakapalle Building Co., Vizagapatam, 86.
- Andhra Lakshmi Industrial Co., Kistna, 83.
- Anna Bank, Multan, 79.
- Annapurna Company Allahabad, 81.
- Aryan Soap and Candle Factory (Mangalore), 17.
- Association for the Advancement of Scientific and Industrial Education, 55, 56.

B.

- Balsundre Mills, Moradabad, 85.
- Bande Mataram Cotton Mills Co., Bengal, 85.
- Bank of Northern India, Rawalpindi, 79.
- Banka Banking, Trading and Agricultural Co., Bengal, 79.
- Bansilal Ahirchand Spinning and Weaving Mills, 60.
- Baranagore Dairy Farm Company, Bengal, 81.
- Baroda Bank, Ltd., 15, 39.
- Baroda Tramway Co., Bombay, 84.
- Basel Mission Weaving Establishments and Tile Works, 17.

Basin Sugar Manufacturing Co. (Agashi), 45.
 Behar Industrial and Agricultural Development Co., Ltd., Gaya, 55, a.
 Behar Industrial Conference, 2, 3, 16.
 Bell Metal Factory (Conjeeveram), 53.
 Bengal Hosiery Co., Ltd., Calcutta, 55.
 Bengal Industrial Co., Bengal, 84.
 Bengal Industrial Conference, 2, 3, 15.
 Bengal Land Lime Brick Co., Bengal, 84.
 Bengal National College, 57.
 Bengal Plumbago Syndicate, Bengal, 87.
 Bhapindro Flour Mills Co., Ambala, Punjab, 86.
 Bharat National Bank, Delhi, 79.
 Bharat Stores, Bombay, 82.
 Bhose and Co., W. N., Bengal, 81.
 Bhuvanagiri Hindu Sasvatha Nidhi, South Arcot, 78.
 Bombay Agricultural Live Stock Co., Bombay, 88.
 Bombay-Bengal Swadeshi Trading Co., Bombay, 81.
 Bombay Brush Manufacturing Co. (Bombay), 49.
 Bombay Dyeing and Manufacturing Co., Ltd., 44.
 Bombay Oil Manufacturing Co., Ltd. (Bombay), 45.
 Bombay Safe Deposit Company, Bombay, 81.
 Bombay Swadeshi Silk and Carpet Manufacturing Co., Bombay, 81.
 Bombay Textile and Engineering Association, 50.
 Boot and Equipment Factory Co., Ltd., 55.
 British India Co-operative Insurance and Banking Co., Broach, 80.
 British India Manufacturing Co., Bombay, 83.
 Burma Co-operative Stores, Rangoon, 84.

C.

Cattle Breeding and Dairy Co., Sargodha, Punjab, 82.
 Central Brotherhood Urban Bank of India and Ceylon, Simla, 79.
 Central Glass Work, Allahabad, 82.
 Central India Hosiery Co., Bombay, 62, 82.
 Central India Outfitting and Tailoring Co., Ltd., 41.
 Central Provinces and Berar Exhibition, 5, 15, 19, 34-35.
 Central Provinces Iron Works and General Trading Co. Ltd. (Nagpur),
 60, 83.
 Central Provinces Swadeshi Spinning, Weaving and Manufacturing Co.,
 Ltd. (Nagpur), 60.
 Chaturvedi Mills Co., Ferozabad, 86.
 Chennai Sri Ekambareswarar Sasvatha Nidhi, Madras, 79.
 Chimanlal Hiralal Mehta's Hosiery (Ahmedabad), 48.
 Circular Letter to the Provincial Committees, 70-72.
 Coimbatore Friends Association, Coimbatore, 82.
 Coimbatore Mill Mills Co., Coimbatore, 85.
 Coimbatore Spinning and Weaving Co., 52.
 Colony Bank, Lyallpur, 79.

- Commercial and Manufacturing Co., Gorakhpore, 83.
 Jeevaram Ela Sasvatha Nidhi, Chingleput, 79.
 Co-operative House, Beogal, 81.
 Co-operative Navigation, Bengal, 80.
 Co-operative Syndicate, Bengal, 81.
 Correspondence between the Government of Bombay and the General Secretary, 63-69.

D.

- Dacca Tannery Works, Dacca, 82.
 Dane Weaving School (Ludhiana), 83.
 Dayabhai and Kirpasanker & Co., Ahmedabad, 81.
 Depressed Classes Industrial Institute, 17.
 Dera Factory Co., Dera Ghazji Khan, 86.
 Devanga Mahasabha (Coimbatore), 52.
 Dharapuram Janopakaram Nidhi, Coimbatore, 78.
Directory of Indian Goods and Industries, 3.
Directory of Technical Institutions, 3.
 District Board Technical Institute (Madura), 18.
 Doaba Bank, Amritsar, 79.
 Dolls, Toys and Button Factory, Ltd. (Kathiawar), 62.
 Dussehra Industrial and Agricultural Exhibition (Mysore), 18, 33.

E.

- East Bengal Mahajani Flotilla Co., Bengal, 80.
 East India Bank, Cawnpore, 79.
 East India Cigarette Manufacturing Co., Bengal, 81.
 Eastern Life Insurance, Bengal, 80.

F.

- Fine Knitting Company, Ahmedabad, 81.
 Fyzabad Bank, Sahebganj, 78.

G.

- ag Cotton Spinning and Weaving Mills, 44.
 esh Company, Bengal, 81.
 ges Sugar Works, Ltd., Unao, 58.
 Factory (Naosari), 49.
 useum (Coimbatore), 18.
 , Madras, 82.
 Oil Mill Co., Bombay, 83.
 Oil Mill Co., Ltd. (Gao), 45.
 strial and Commercial Co., Godavari, 85.
 g and Press Co., Lahore, 86.
 ming, Weaving and Manufacturing Co., Ahmedabad, 85.
 ing and Manufacturing Co., 44.

Government and Industrial Development, 20—42.

Baroda, 38—40 ; Bengal, 26—28 ; Bombay, 22—24 ; Central and Berar, 34—35 ; Chota Udepur, 42 ; Cochin, 42 ; Eastern Assam, 33—34 ; Gwalior, 40—41 ; Junagadh, 41—42 ; Madras Moubhanj, 42 ; Mysore, 36—38 ; Nizam's Dominions, 35—36 ; 33 ; United Provinces, 28—32.

Govindo Mills Co., Khanna, Punjab, 87.

Government School of Commerce (Calicut), 18.

Government Tannery (Sainbiam), 51.

Government Weaving Factory (Salem), 17.

Gujarat Hosiery Factory (Ahmedabad), 48

Gujarath Industrial Association, 15.

Gujarath Islam Match Manufacturing Co., 15.

Gujarati Swadeshi Stores, Ahmedabad, 84.

Guzdar & Co., R. M., Allahabad, 83.

Gwalior Cotton Mill, Ltd., 41.

H.

Handloom Competition (Surat), 2.

Handloom Conference, 4.

Himabhai Manufacturing Co. (Ahmedabad), 43.

Hind Life Insurance Co., Ltd., 49.

Hindu Industrials, Tanjore, 85.

Hindu Life Insurance Co., Bombay, 80.

Hindupur Co-operative Society, Anantapur, 83

Hindustan Assurance and Mutual Benefit Society, Gujranwalla, 80.

Hindustan Bank, Bengal, 78.

Hindustan Cap Factory (Bombay), 48.

Hole-Narsipur Weaving Institute, 38.

Hyderabad Industrial and Commercial Co., Ltd., 61.

I.

Imperial Agricultural College and Research Institute (Pusa), 1

Indian Agricultural Association, Vizagapatam, 87.

Indian Dyeing and Printing Works, Bombay, 86.

Indian Felt-Topilla Manufacturing Co. (Bombay), 45.

Indian Flour Mills, Karachi, Bombay, 86.

Indian Industries, South Arcot, 86.

Indian Industries, Ltd. (Chidambaram), 53.

Indian Institute of Science, 18, 21.

Indian Institute of Sciences, Lahore, 87.

Indian Merchants' Chamber and Bureau, 50.

Indian Marine Insurance Co., Ltd., 49, 80.

Indian National Co-operative Society, 84.

Indian National Weaving Fraternity, Madras

Indian Nitrate and Alkali Co., Cawnpore

Indian Oil Mills Co., Guwahati, 86.

